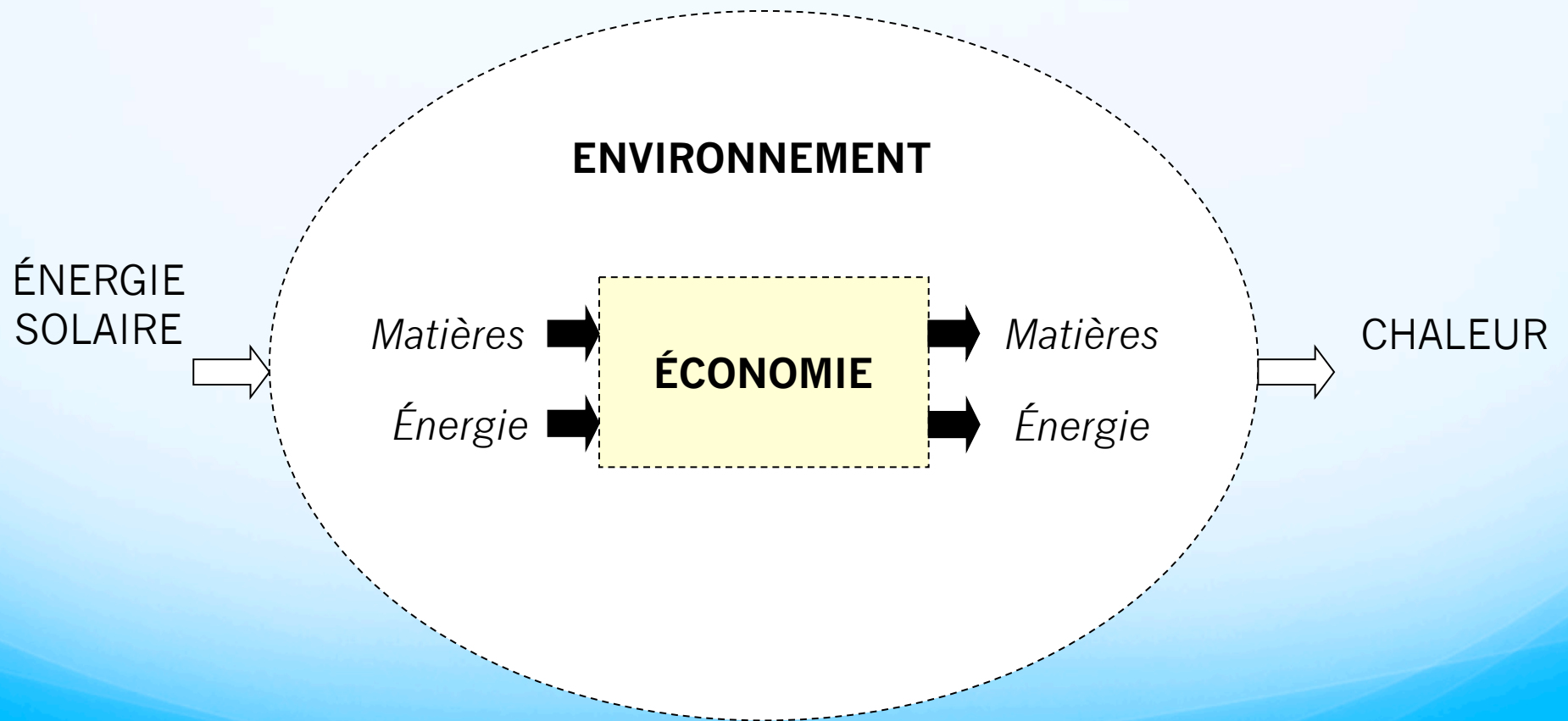


Have Efforts At Sustainable Development Failed?

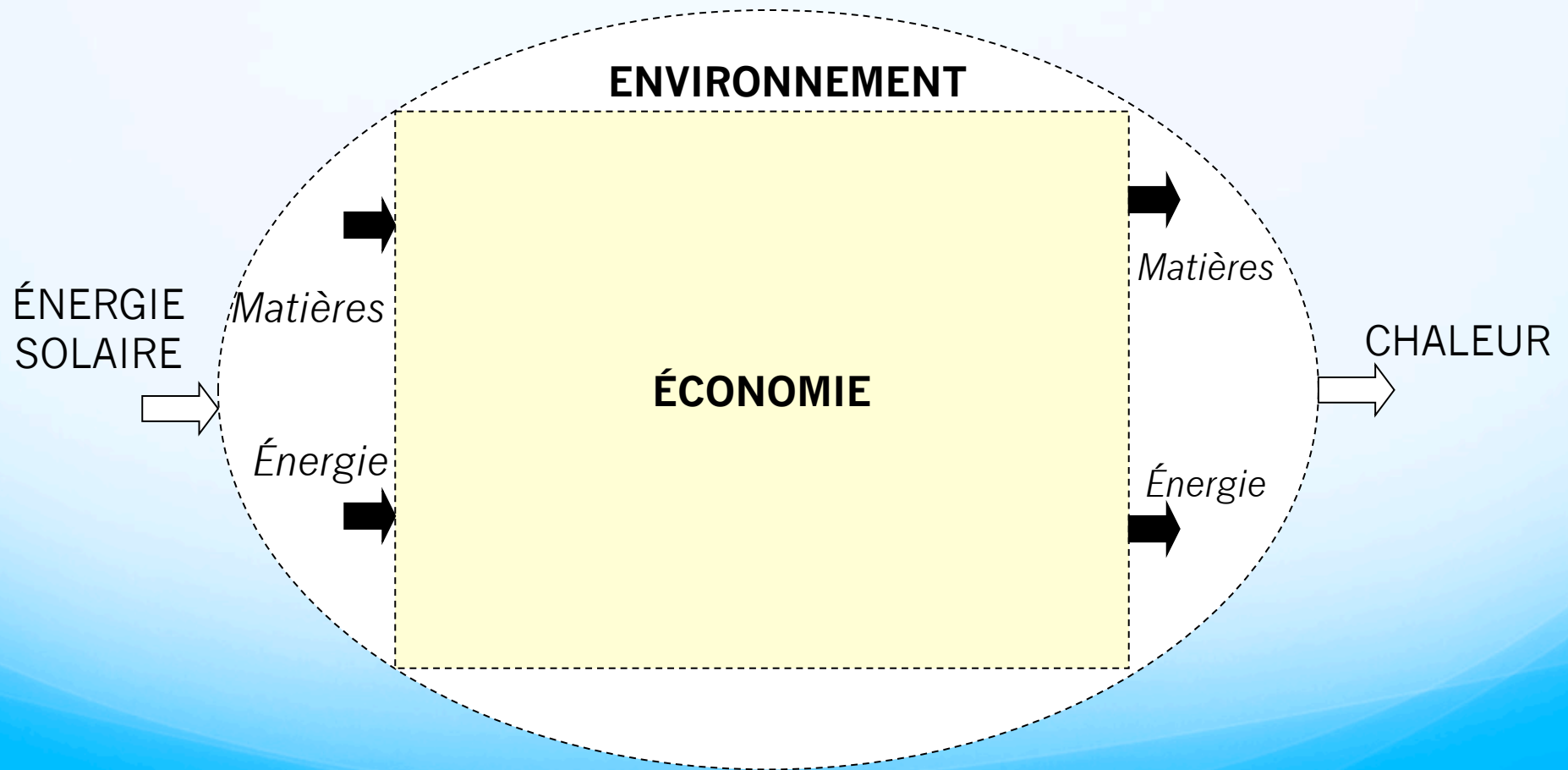
Presentation by Harvey L. Mead
XVIIth World Congress of the International Commission
Of Agricultural and Biosystems Engineering

Quebec City Convention Centre
June 16, 2010
Delta Centre-ville

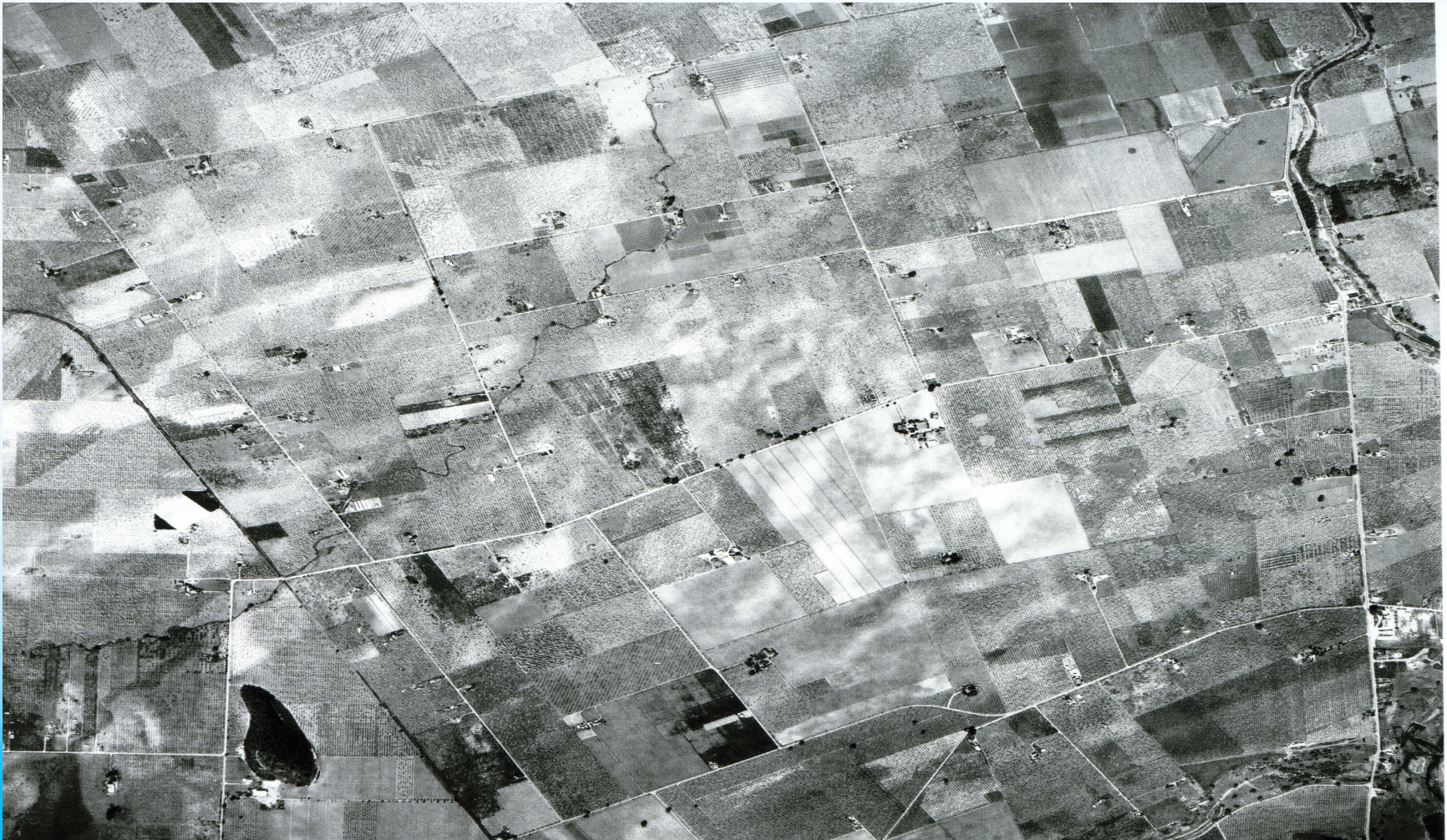
Early sustainability for ecological economists - 1



Sustainability earlier on for ecological economists - 2

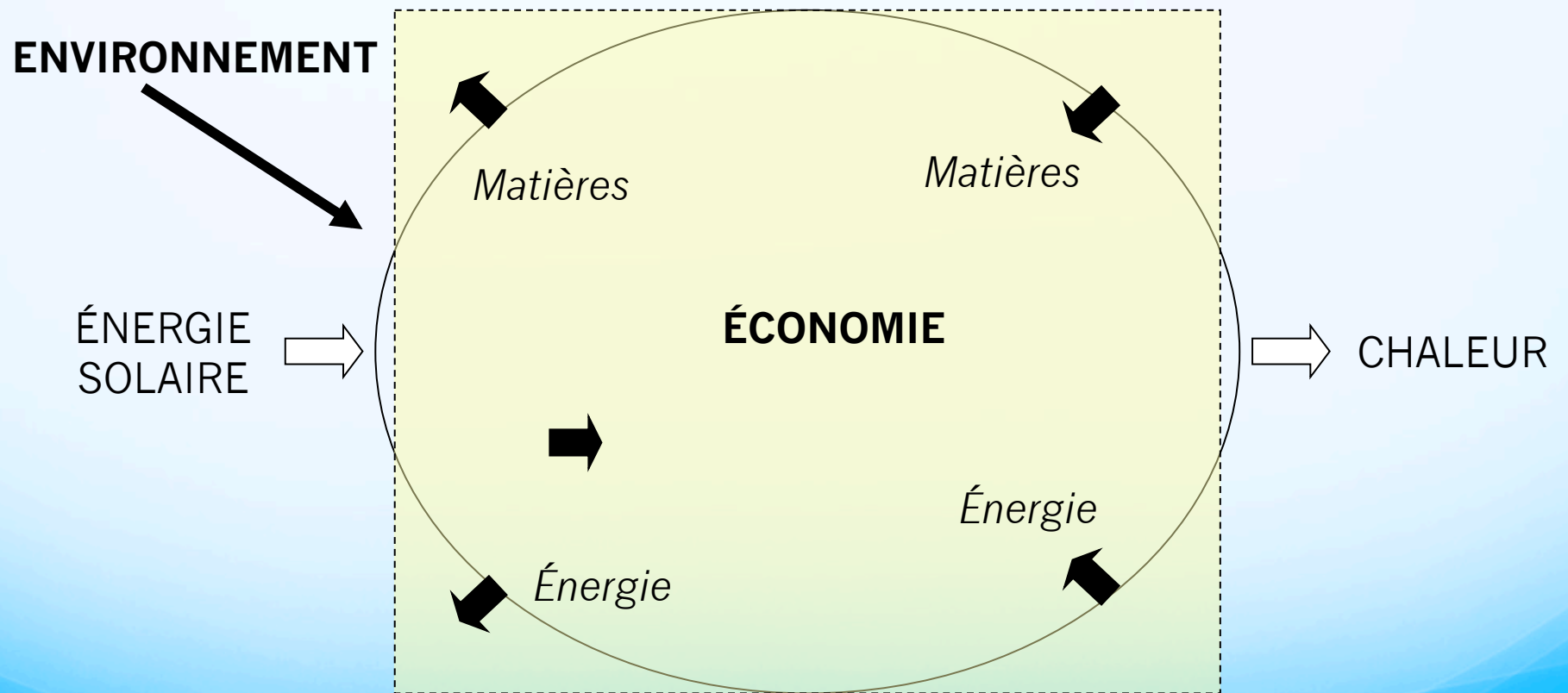


Silicon Valley : Open Earth

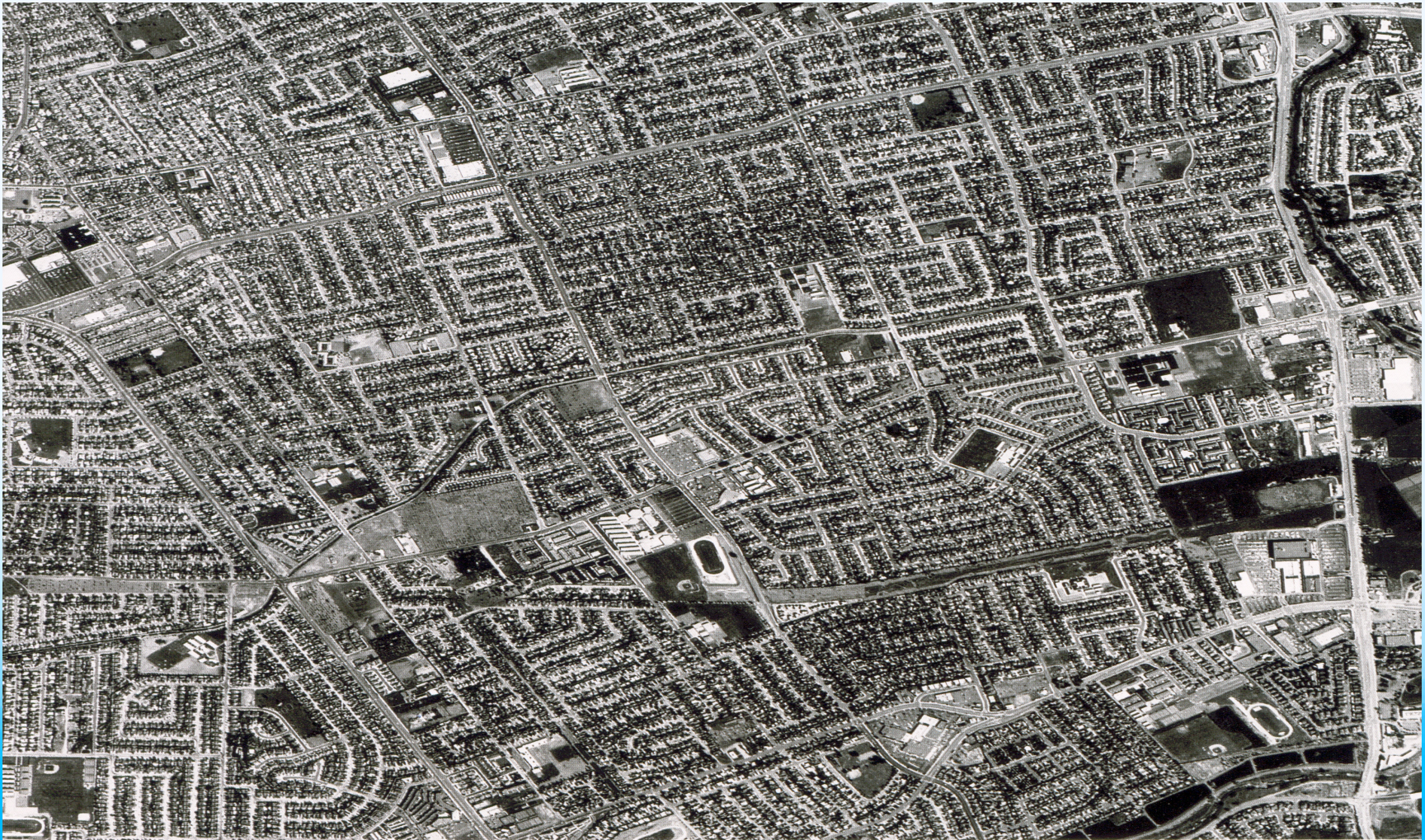


Source: An Introduction to the World Conservation Strategy, United Nations Environment Programme, p. 10.

Today's lack of sustainability for ecological economists - 3



Silicon Valley : Full Earth



Source: An Introduction to the World Conservation Strategy, United Nations Environment Programme, p. 10.

BP in the Gulf of Mexico 1



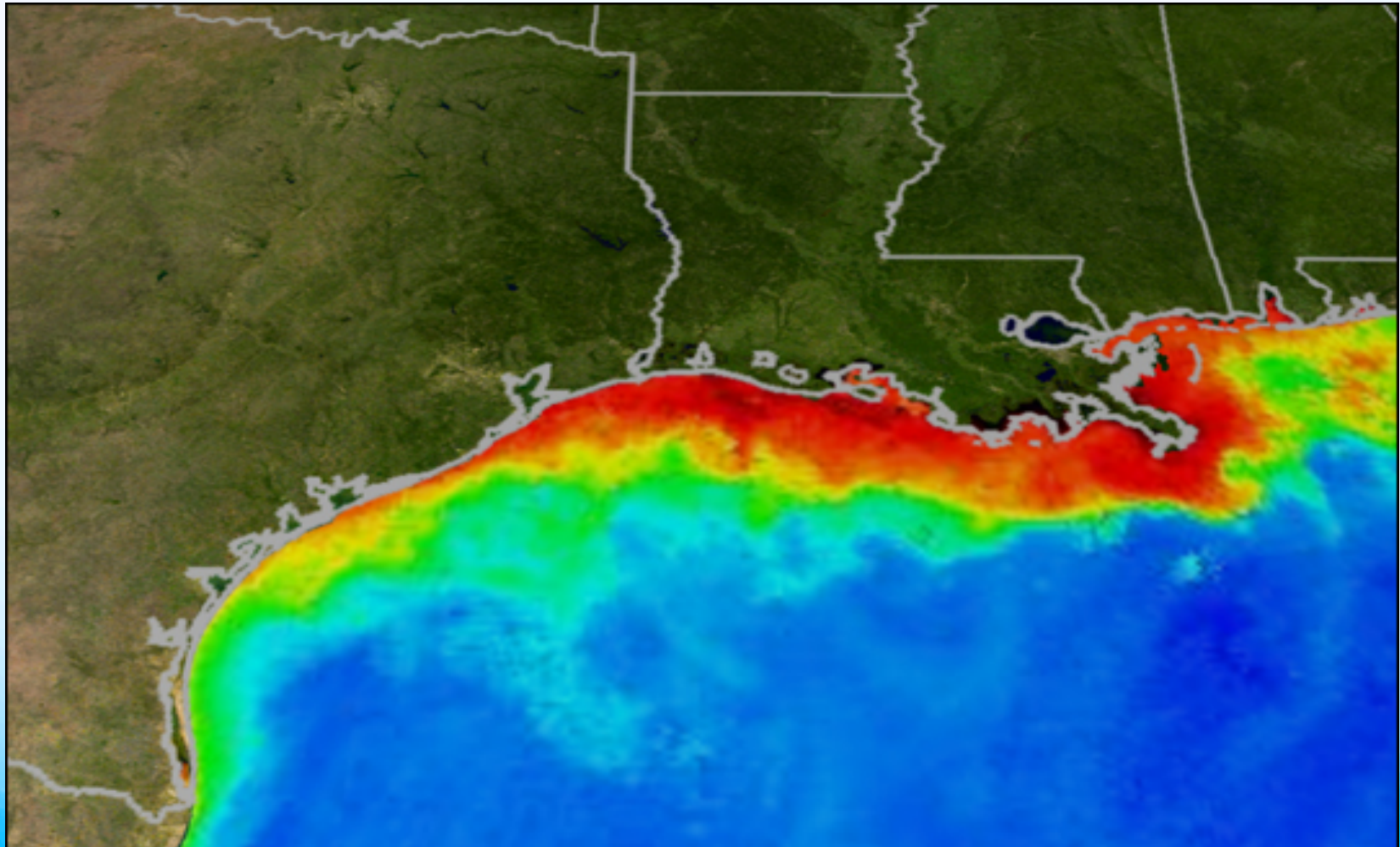
http://news.nationalgeographic.com/news/2010/05/photogalleries/100504-gulf-of-mexico-oil-spill-environment-nation-pictures/#gulf-oil-spill-satellite-picture-timeline-april-29_19873_600x450.jpg

BP in the Gulf of Mexico 2



http://news.nationalgeographic.com/news/2010/05/photogalleries/100504-gulf-of-mexico-oil-spill-environment-nation-pictures/#gulf-oil-spill-satellite-picture-timeline-april-29_19873_600x450.jpg

Agriculture in the Gulf of Mexico



from the Mississippi basin



<http://mondedurable.science-et-vie.com/2009/07/le-retour-de-la-mer-morte/>

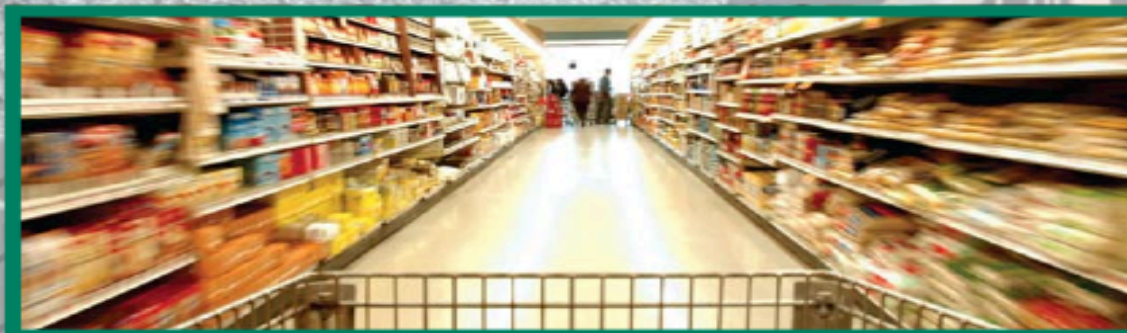


International Panel
for Sustainable
Resource Management

ASSESSING THE ENVIRONMENTAL IMPACTS OF CONSUMPTION AND PRODUCTION

Priority Products and Materials

ENVIRONMENT PROGRAMME



2010 UNEP Report

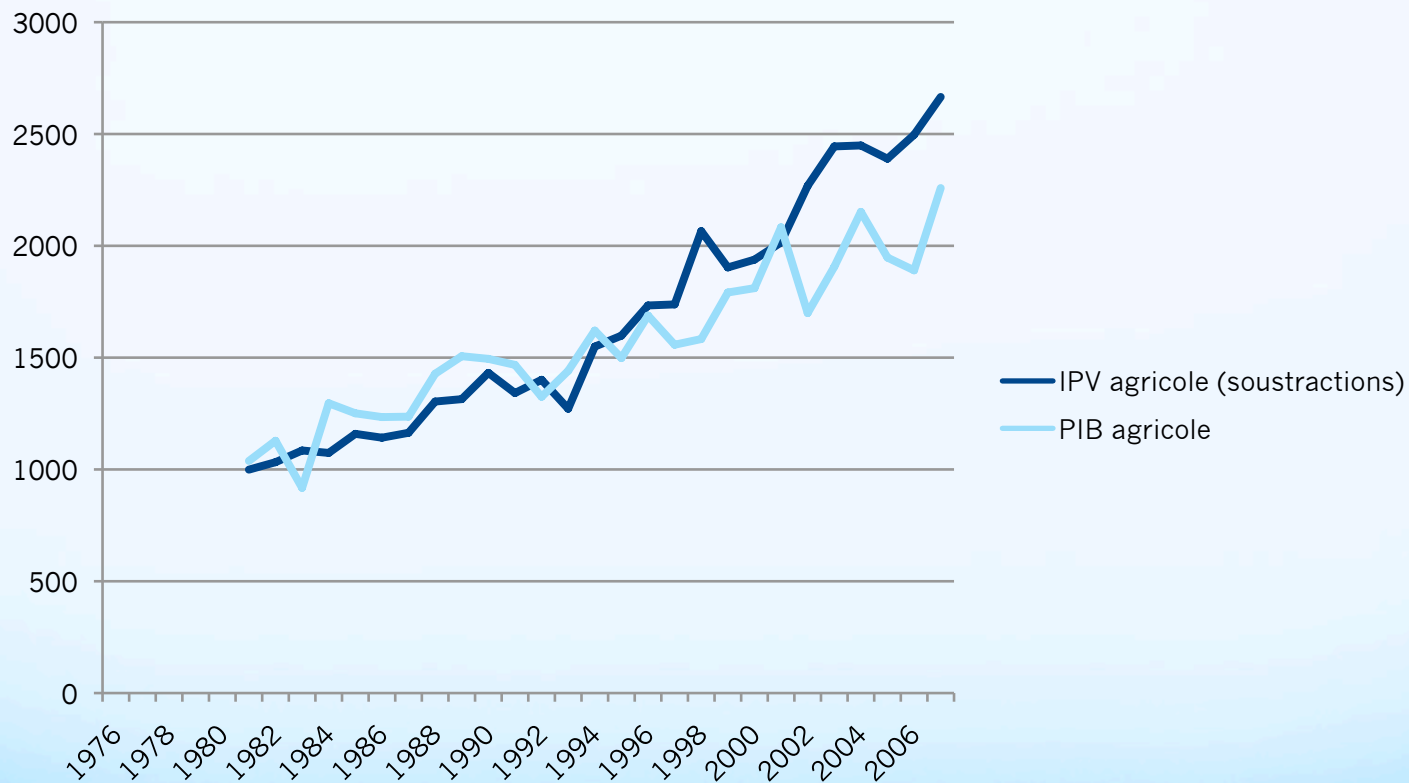
- So, what are the most important **industries** that cause climate change? How much **energy** do different **consumption** activities require when the production of the products is taken into account? What are the **materials** that contribute most to environmental problems? The three perspectives are interrelated, as industries use and process materials and contribute to the production of consumer products.
- Maybe not surprisingly, **we identify fossil fuels use and agricultural production as major problem areas**. We illuminate these from the three perspectives. The relative importance of industries, consumption categories and materials varies across the world, as our assessment shows.

Assessing the Environmental Impacts of Consumption and Production: Priority Products and Materials, UNEP, 2010

2010 UNEP Report

- The different studies, and different perspectives , paint a consistent overall picture:
 - a. **Agriculture and food consumption are identified as one of the most important drivers of environmental pressures**, especially habitat change, climate change, fish depletion, water use and toxic emissions.
 - b. **The use of fossil fuels for heating, transportation, materials production and the production and use of electrical appliances is of comparable importance**, causing the depletion of fossil energy resources, climate change, and a wide range of emissions-related impacts.

Agriculture's impacts



Source: Harvey L. Mead

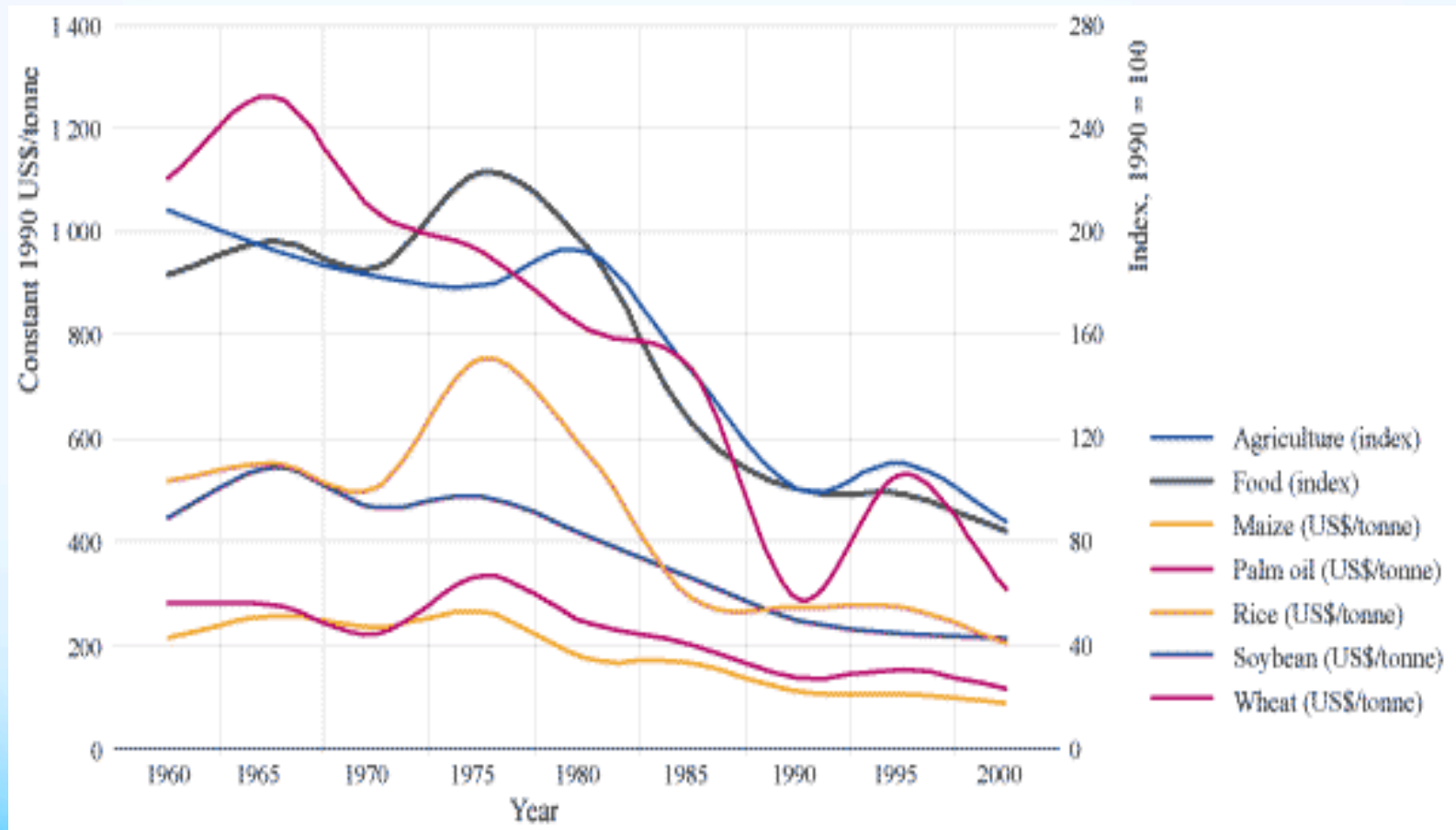
Lester Brown 1995

- *Who Will Feed China?*
 - Demography
 - Changes in nutritional habits
 - Loss of agricultural land = urbanisation
 - Diminishing water resources = industrialisation
 - Productivity of agriculture reaching its limits
 - International commerce
- **Response: the rest of the world**

FAO 2002: World agriculture: towards 2015/2030 (Summary report)

- So far, world agriculture has been able to respond to the rising demand for crop and livestock products. **Although the world's population doubled between 1960 and 2000 and levels of nutrition improved markedly, the prices of rice, wheat and maize - the world's major food staples - fell by around 60 percent. The fall in prices indicates that, globally, supplies not only kept pace with demand, but even outstripped it.**
- <http://www.fao.org/docrep/004/y3557e/y3557e03.htm#c> - same for following slides

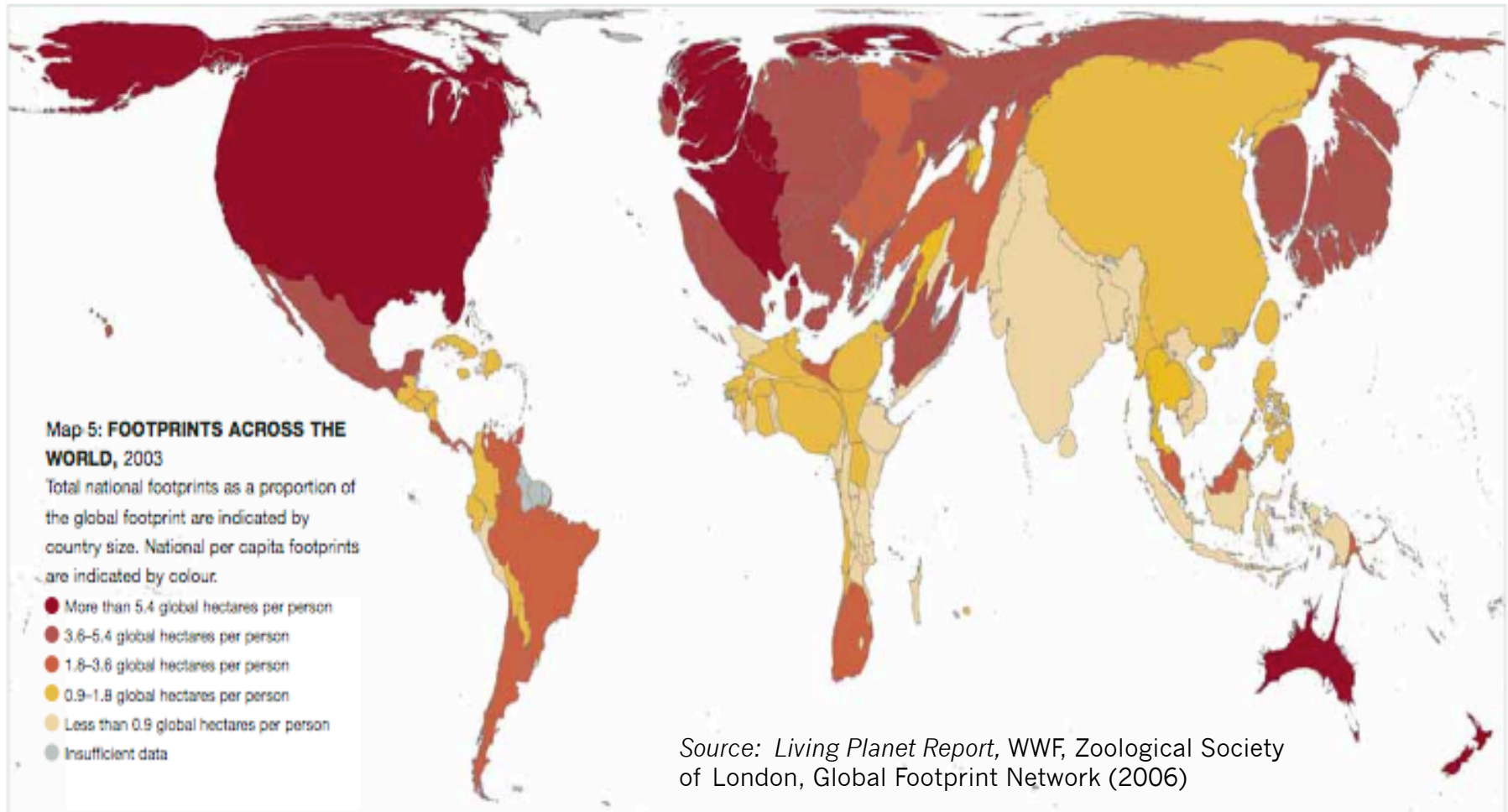
FAO: World market prices for agricultural commodities, 1960 to 2000



FAO 2002

- **In recent years the growth rates of world agricultural production and crop yields have slowed.** This has raised fears that the world may not be able to grow enough food and other commodities to ensure that future populations are adequately fed. However, **the slowdown has occurred not because of shortages of land or water but rather because demand for agricultural products has also slowed.** This is mainly because world population growth rates have been declining since the late 1960s, and fairly high levels of food consumption per person are now being reached in many countries, beyond which further rises will be limited. **But** it is also the case that a stubbornly high share of the world's population remains in absolute poverty and so lacks the necessary income to translate its needs into effective demand.

The Fat Planet 2009: Our Footprint = 1.3 Planets



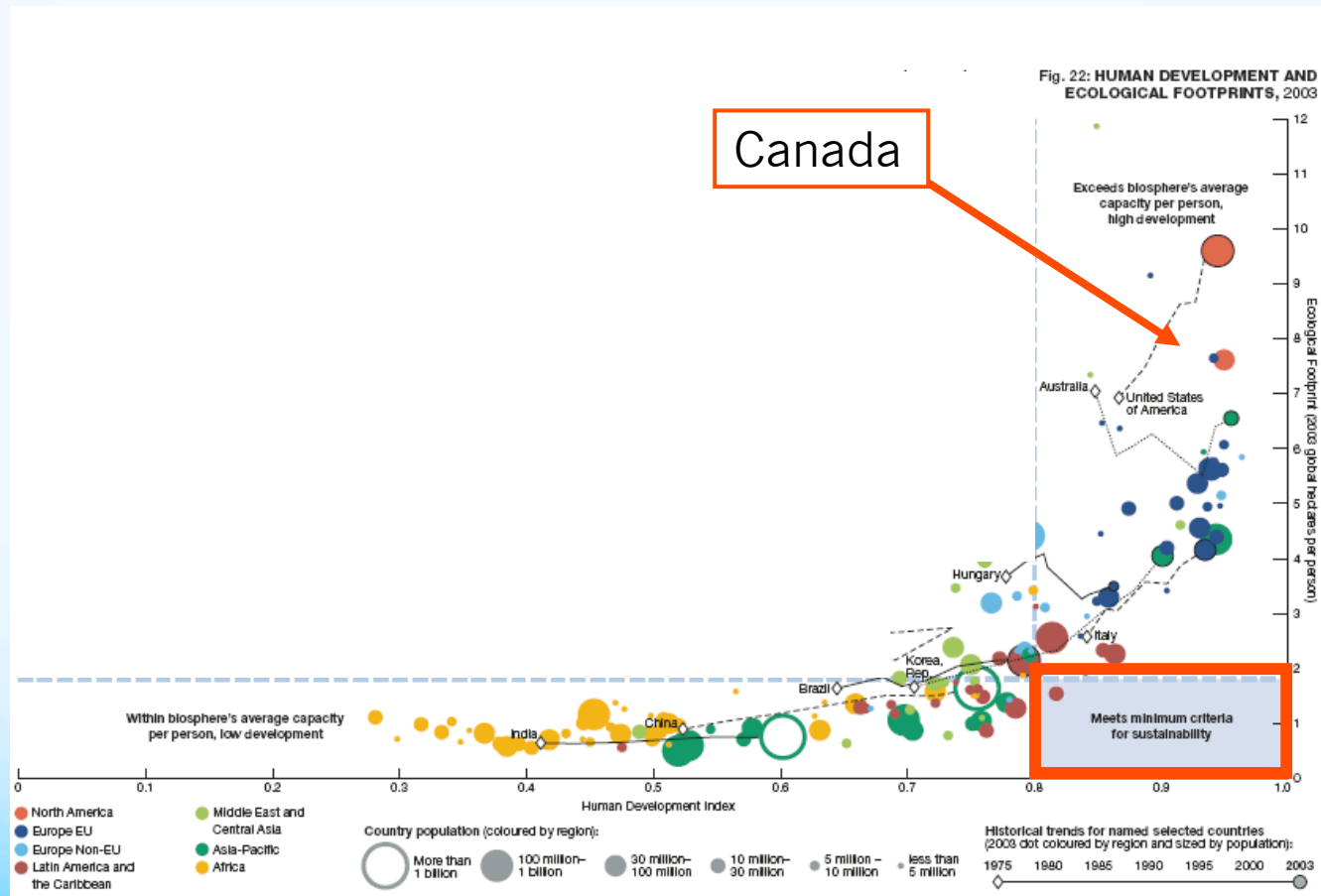
FAO 2002

- Growth in demand will slow still further in the future. The world as a whole has the production potential to cope with demand. **However,** **developing countries will become more dependent on agricultural imports**, and food security in many poor areas will not improve without substantial increases in local production.

FAO 2002

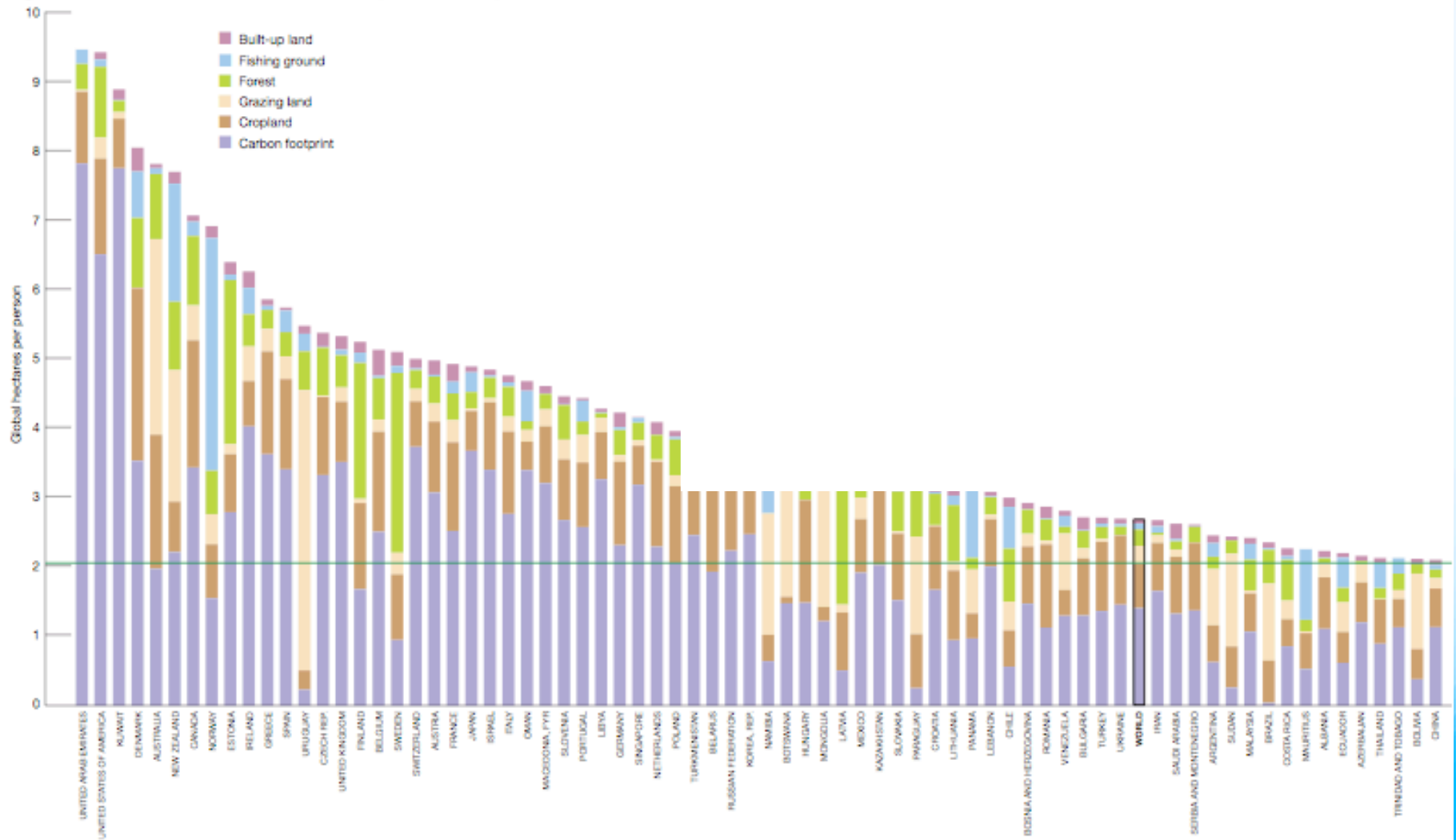
- Apart from temporary factors (foremost among them a decline in consumption in the transition economies in the 1990s), there were two more enduring reasons for the slowdown:
 - **The growth rate of world population peaked in the late 1960s** at 2 percent a year and slowed thereafter.
 - **A rising proportion of the world's population had reached fairly high levels of food consumption**, so the scope for further increase was limited. By 1997-99, 61 percent of the world's population were living in countries where average food consumption per person was above 2 700 kcal per day.

The ecological footprint and the Index of Human Development



The *per capita* Ecological Footprint

Fig. 22: ECOLOGICAL FOOTPRINT PER PERSON, BY COUNTRY, 2005



FAO 2002: recapitulation

- **World population will go on rising, but less rapidly, growing at an average of 1.1 percent a year up to 2030, compared with 1.7 percent a year over the past 30 years. By 1997-99, 61 percent of the world's population were living in countries where average food consumption per person was above 2 700 kcal per day.**
- **As a result, future demand for agricultural products is expected to slow further - to 1.6 percent a year for the period 1997-99 to 2015 and to 1.4 percent for 2015 to 2030. In developing countries the slowdown will be more dramatic, from 3.7 percent for the past 30 years to an average 2 percent for the next 30.**

FAO 2002

- **The forces underlying this slowdown can be seen in the example of China**, which has been one of the major engines of growth in the demand for food and agricultural products in the world and in the developing countries over the past few decades. **By 1997-99 the Chinese had reached an average daily food consumption of 3 040 kcal - only 10 percent short of the level in industrial countries.** Over the next three decades the country's aggregate food consumption is expected to grow at only a quarter of the rate seen in the past three decades, while its population will grow at a third of its past rate. **Given the sheer size of China's population, these shifts alone will have a huge effect on the global situation. Many other countries, including some of the largest ones, will be undergoing very similar shifts that will further lower the growth of demand.**

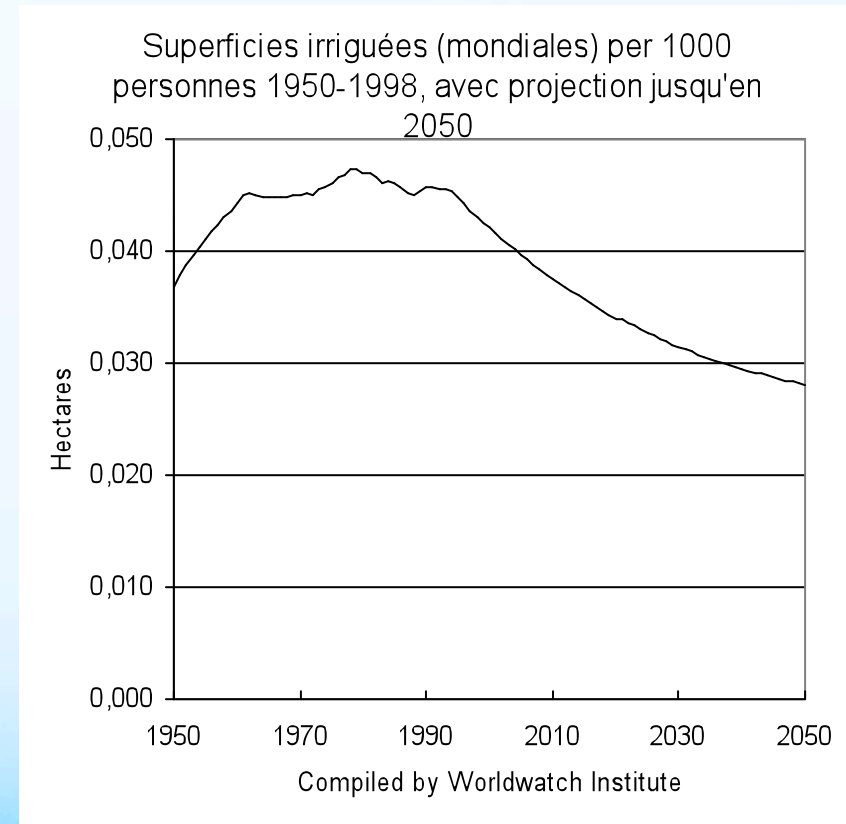
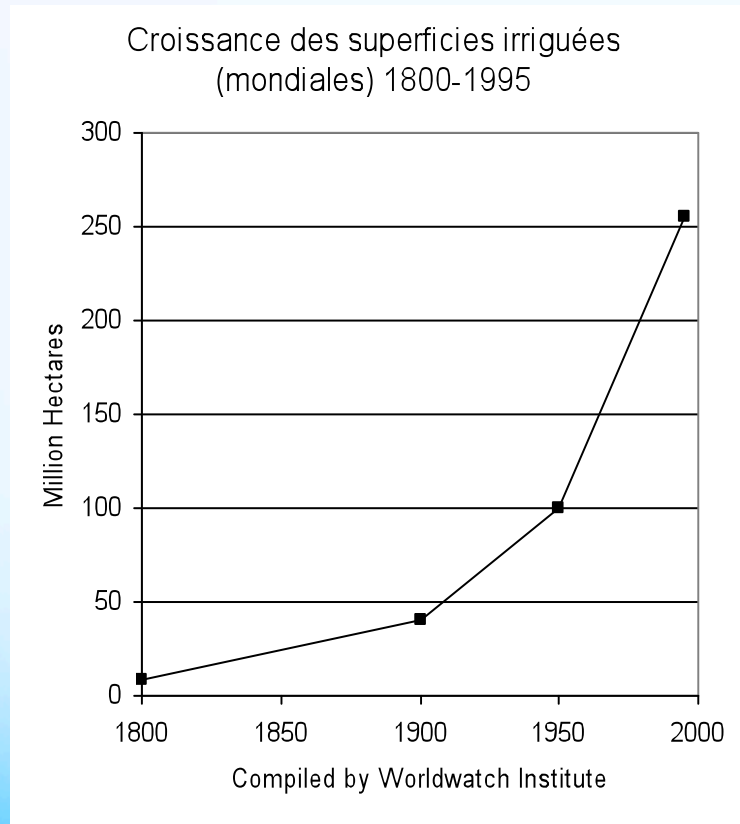
FAO 2002

- There are **three main sources of growth in crop production**:
 - expanding the **land** area,
 - increasing the frequency with which it is cropped (often through **irrigation**), and
 - boosting yields.
- It has been suggested that we may be approaching the ceiling of what is possible for all three sources. A detailed examination of production potentials does not support this **view at the global level**, although in some countries, and even in whole regions, serious problems already exist and could deepen.

FAO 2002 – business as usual

- **Irrigation** is crucial to the world's food supplies. In 1997-99, irrigated land made up only about one-fifth of the total arable area in developing countries but produced two-fifths of all crops and close to three-fifths of cereal production. **The role of irrigation is expected to increase still further.** The developing countries as a whole are likely to expand their irrigated area from 202 million ha in 1997-99 to 242 million ha by 2030. Most of this expansion will occur in land-scarce areas where irrigation is already crucial.

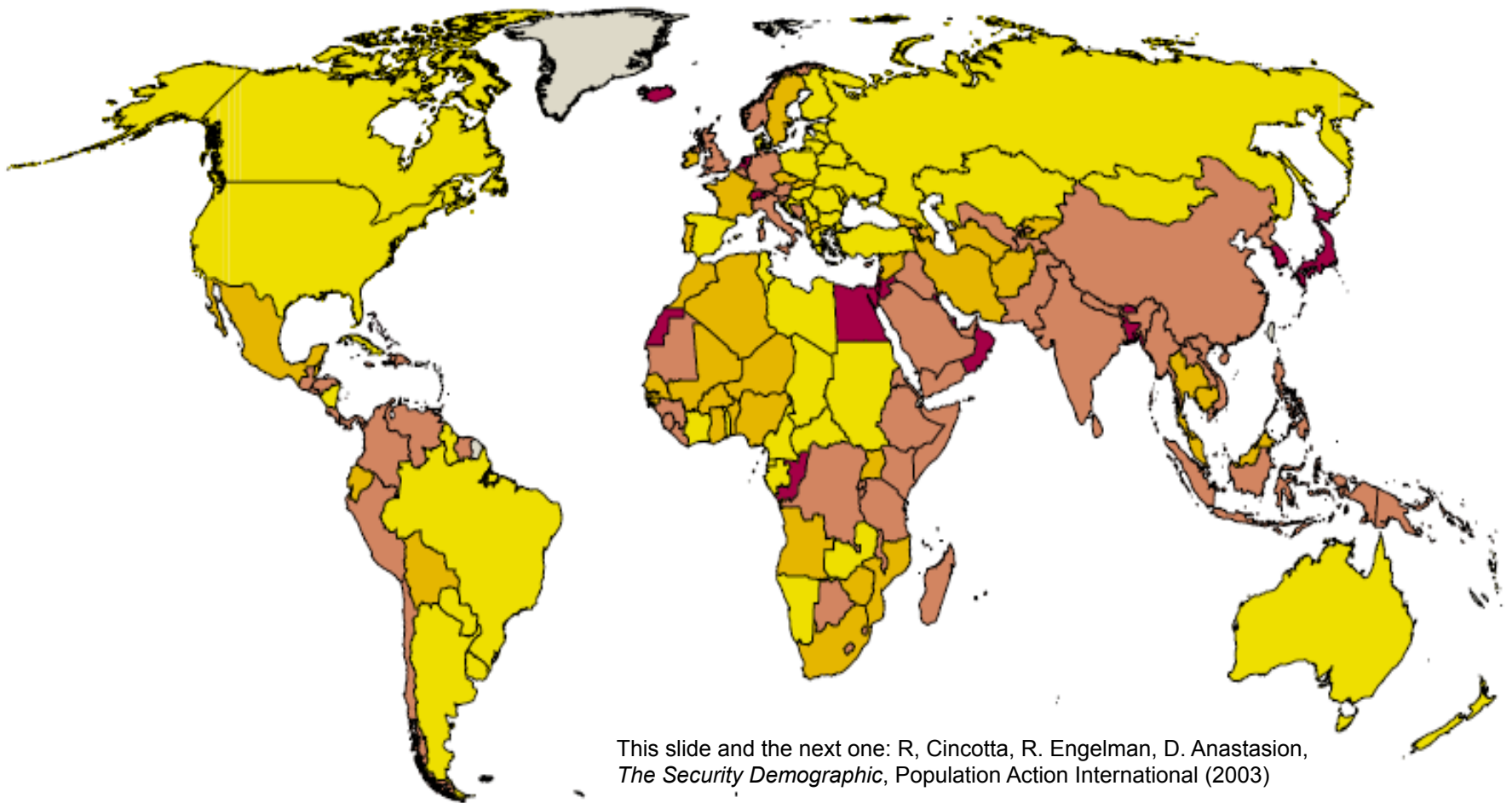
Development and Water: Irrigated Area 1950-1998-2050...



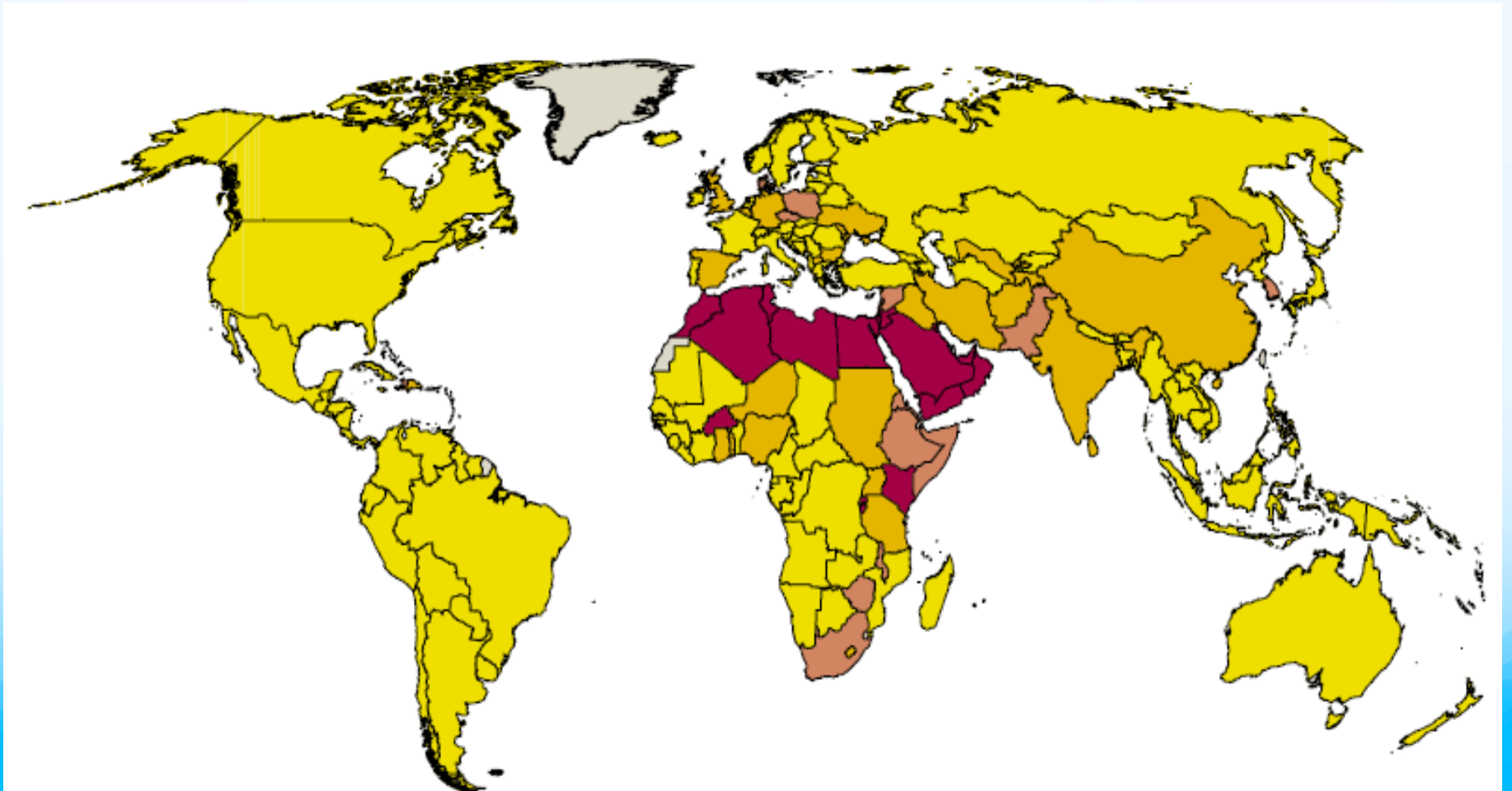
FAO 2002 – Market Focus

- **Detailed analysis shows that, globally, there is enough land, soil and water, and enough potential for further growth in yields, to make the necessary production feasible.** Yield growth will be slower than in the past, but at the global level this is not necessarily cause for alarm because slower growth in production is needed in the future than in the past. However, the feasible can only become the actual if the policy environment is favourable towards agriculture. **Globally, producers have satisfied effective market demand in the past, and there is every likelihood that they will continue to do so. But** effective demand does not represent the total need for food and other agricultural products, because hundreds of millions of people lack the money to buy what they need or the resources to produce it themselves.

Zones At Risk On the Planet For Land and Food



Zones At Risk On the Planet For Water and Food



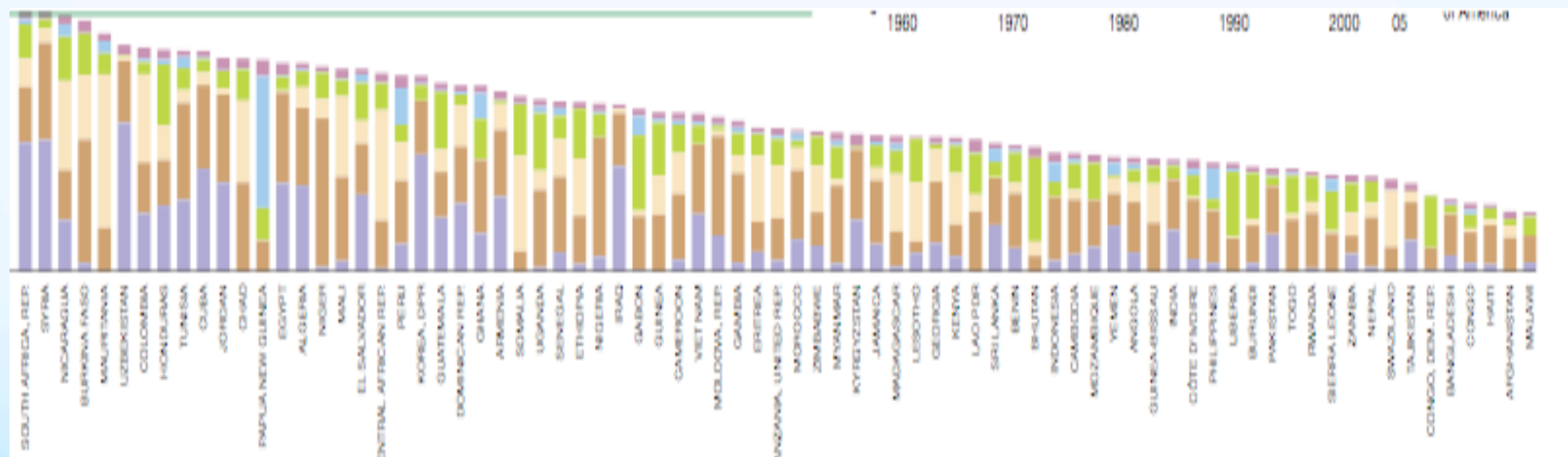
FAO 2002 - Myopia

- At the other extreme, the share of the world's population living in countries with average food energy intakes above 2 700 kcal per person per day has more than doubled, from 30 percent to 61 percent. Rapid gains in some of the largest developing countries, including China, Brazil, Indonesia and Nigeria, account for much of this progress. **India, however**, has yet to move into this category. Over this same period, world annual consumption of cereals for both food and feed has doubled to 1.9 billion tonnes, while that of meat has more than doubled - **no mean achievement considering popular fears** that the world was running out of potential to increase production. The main forces driving this achievement have included
 - **higher incomes**, which have increased effective **demand**,
 - **increased supplies**, owing to improvements in productivity, and
 - **the growth of trade and transport links**, which have allowed food deficits in some areas to be covered by surpluses from other areas.

FAO 2002 – Unrelenting Hope

- In China, huge reductions in poverty raised national average food consumption substantially - and this had a strong effect on the global picture. **If China is removed from the picture, it becomes clear that the number of under-nourished people actually increased in the other developing countries, by almost 40 million.**
- **By 2030, three-quarters of the population of the developing world could be living in countries where less than 5 percent of people are undernourished. Only 1 in 13 live in such countries at present.**

Footprint: developing nations



FAO 2002 – No Cause for Alarm

- The annual growth rate of world **demand** for cereals has declined from 2.5 percent a year in the 1970s and 1.9 percent a year in the 1980s to only 1 percent a year in the 1990s. Annual cereal use per person (including animal feeds) peaked in the mid-1980s at 334 kg and has since fallen to 317 kg. **The decline is not cause for alarm: it was above all the natural result of slower population growth and shifts in human diets and animal feeds.** However, in the 1990s it was accentuated by a number of temporary factors, including serious recessions in the transition countries and some East and Southeast Asian countries.

FAO 2002 – the silo

- The growth rate of demand for cereals is expected to rise again to 1.4 percent a year to 2015, slowing to 1.2 percent per year thereafter. **In developing countries overall, cereal production is not expected to keep pace with demand. The net cereal deficits of these countries**, which amounted to 103 million tonnes or 9 percent of consumption in 1997-99, **could rise to 265 million tonnes by 2030**, when they will be 14 percent of consumption. **This gap can be bridged by increased surpluses from traditional grain exporters, and by new exports from the transition countries**, which are expected to shift from being net importers to being net exporters.

Lester Brown 2006

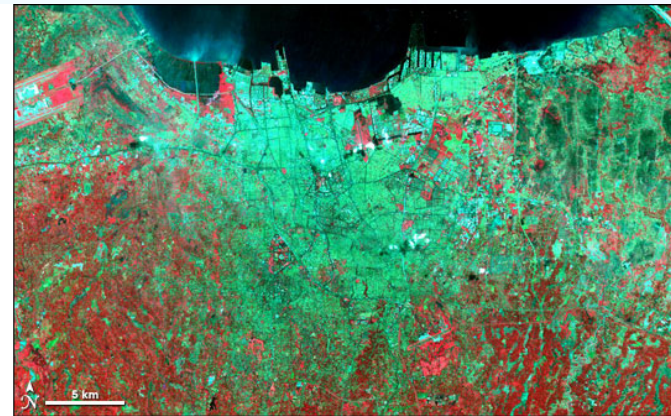
- Capital: **The main risk which threatens us, according to you, is not peak oil but a serious food crisis.** Why do you think this?
- Lester Brown : **Because the destruction of the environment already has dramatic consequences for agriculture.** Take the example of **water**. Each person drinks on average four litres of water a day, but to produce a day's ration in food, 2000 litres are necessary. But **water tables are dropping everywhere**, even if this is an invisible development. It is transforming Texas, Kansas, northern China and regions of India into dry, unproductive land. Furthermore, **urbanisation converts 3 million hectares of land into roads and buildings each year.**

Source for this and the following slides: <http://docsmartinez.free.fr/dotclear/index.php?post/2006/04/26/31-lester-brown-une-grave-crise-alimentaire-menace-le-monde>

Non-sustainable management of agricultural land: Jakarta:1976-2004



1976 : 5 millions d'habitants



1989 : 7,4 millions d'habitants

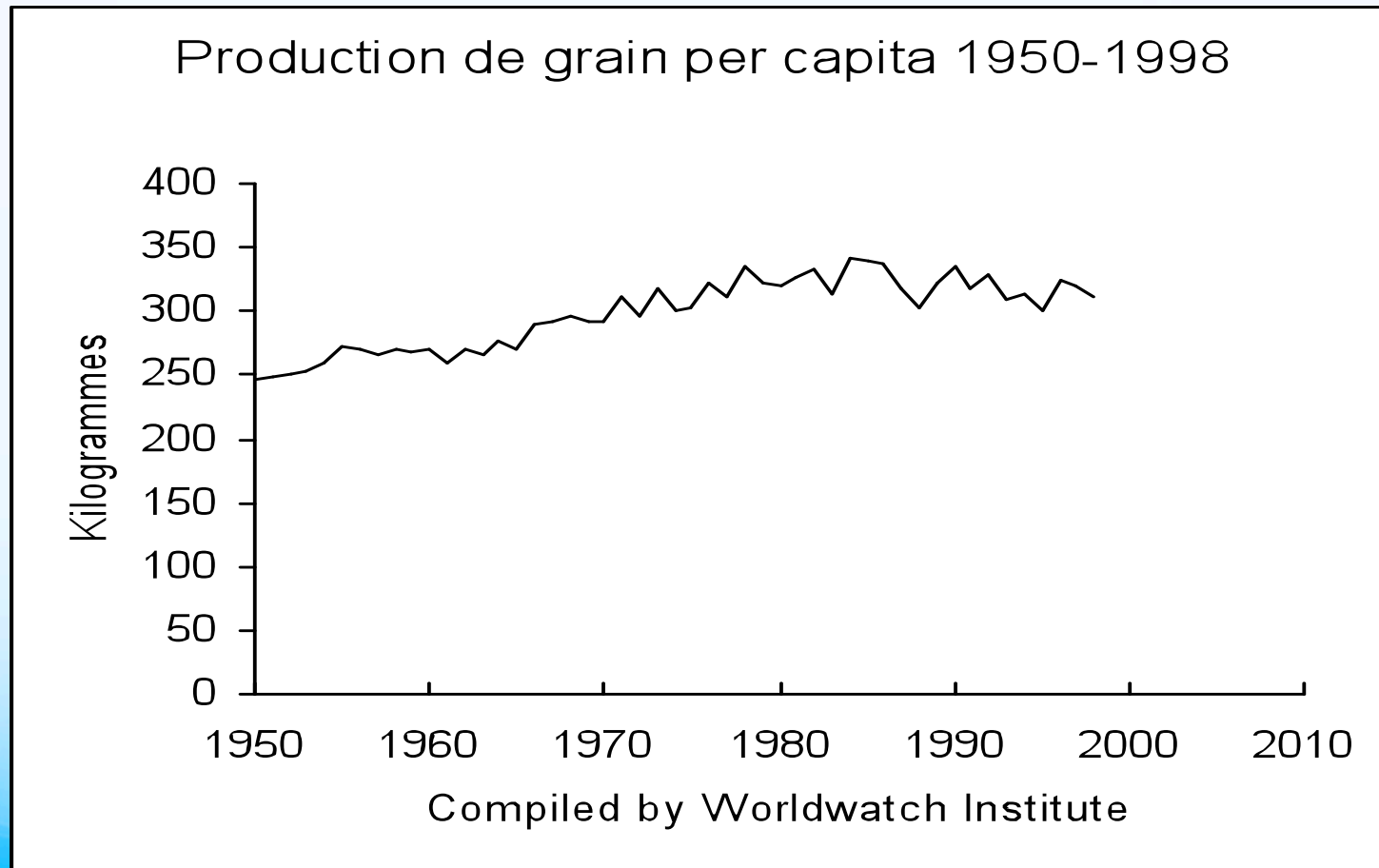


2004 : 13 millions d'habitants

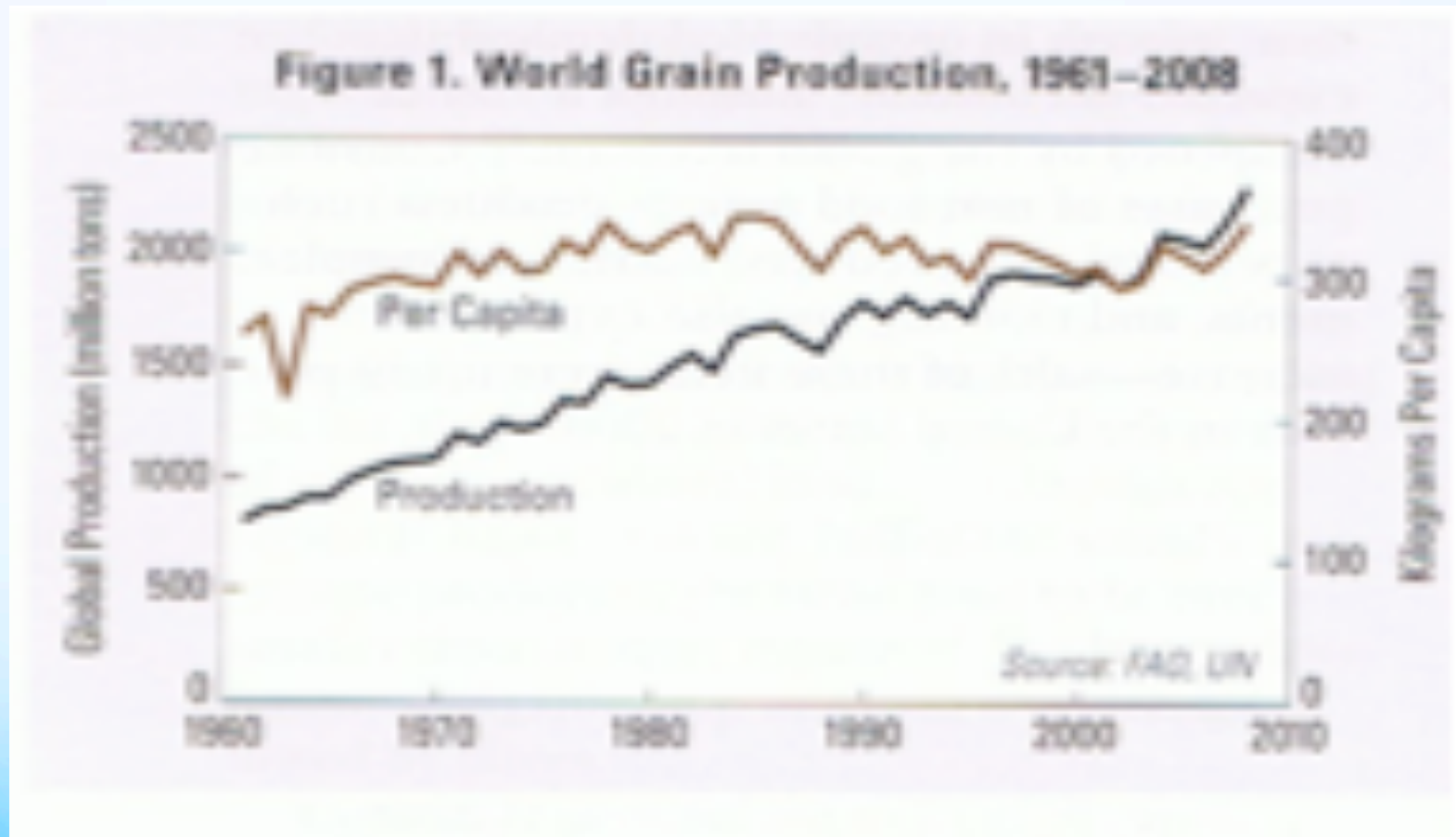
Lester Brown 2006

- Capital: Agricultural productivity hasn't been increasing?
- Lester Brown : No, it has reached a plateau. The result: after tripling between 1950 and 1996, **grain production is no longer increasing.** During five of the last six years, production has been less than consumption. This means that we have been drawing down on our stocks, which are at an all-time low. **As world population has been increasing by 70 million people a year, per capita production has already decreased by 10% from its historical high.** In short, in the area of food, as in that of energy, we are leaving an era of abundance and **we are entering an era of rarity.**

World Grain Production *per capita* 1950-1998



World Grain Production 1961-2008



Lester Brown 2006

- **If** the Chinese ate as much meat as Americans, **their herds would require half the entire world production of grain.** And if they had three cars for four inhabitants, their **need for oil would be greater than present world production.** It's quite clear: the Western economic model can't function either in China or in India.

Lester Brown 2006

- Capital: But **food prices are not going up....**
- Lester Brown : **It won't be long.** Since 1998, the production of grains in China has decreased, from 392 to 322 million tons. The most populous country in the world is no longer self-sufficient with respect to food, to the extent that in 2003-2004 it became the largest importer of wheat and soya in the world. **Sooner or later, perhaps this year, the Chinese will have a bad harvest and need to obtain 40 to 60 millions tons of grain on the world market. At that point, prices will jump, perhaps doubling from one day to the next. Consequences: Third World countries, which import a large part of their food, will be destabilized by food riots.**
- European peasants will finally be able to live without agricultural subsidies; the United States, which exports 40% of the grain sold on the world market, will get their balance of payments in order; everywhere in the world, talk of food independence will be as common as talk about energy independence.

Lester Brown 2006

- Capital: **Our growth model leading us to catastrophe, can we adopt another model?**
- Lester Brown : Yes, **if we act urgently to implement the changes essential to preserving earth's ecosystems – following the example of countries transforming their economies in record time, during the war or after**, during the Marshall Plan period. It's possible because **we possess the technologies to construct a new economy**. For example, hybrid or electric cars, giant windmills with high production, systems of drip-**irrigation**, fluorescent tubes and household appliances which use one tenth the electricity of present ones. We also know how to recycle paper, metals, tires, components of electronic equipment. **We just have to decide.**

IAASTD 2008

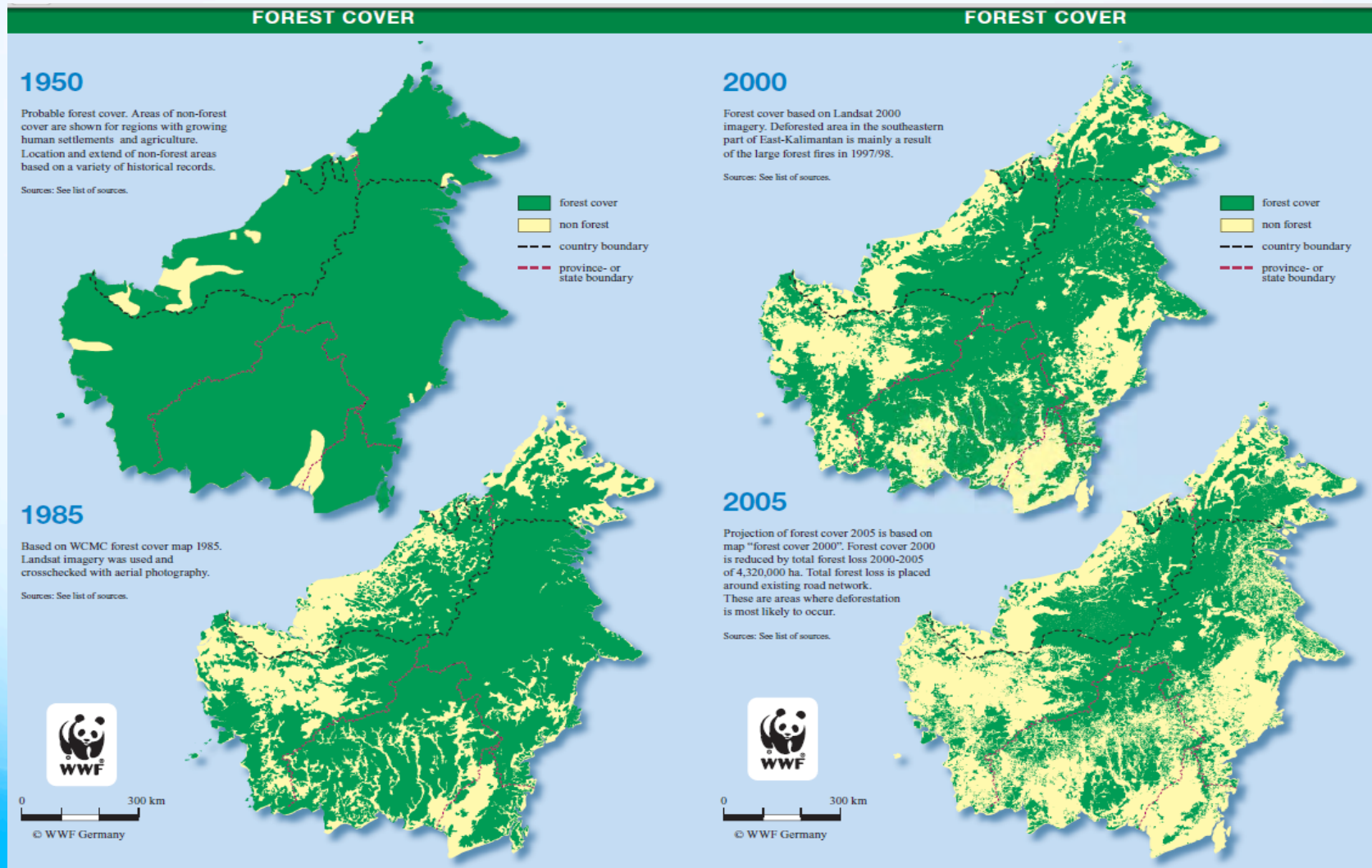
- WASHINGTON/LONDON/NAIROBI/DELHI - 15th April 2008.

The way the world grows its food will have to **change radically to better serve the poor and hungry if the world is to cope with a growing population and climate change while avoiding social breakdown and environmental collapse.** That is the message from the report of the **International Assessment of Agricultural Science and Technology for Development**, a major new report by over 400 scientists which is launched today. The assessment was **considered by 64 governments** at an intergovernmental plenary in Johannesburg last week.

IAASTD 2008

- The report has assessed that the way to meet the challenges lies in putting in place institutional, economic and legal frameworks that **combine productivity with the protection and conservation** of natural resources like soils, water, forests, and biodiversity while meeting production needs.
- In many countries, it says, food is taken for granted, and **farmers and farm workers are in many cases poorly rewarded** for acting as stewards of almost a third of the **Earth's land**. Investment directed toward securing the public interest in agricultural science, education and training and extension to farmers has decreased at a time when it is most needed.

Agriculture in Borneo 1985-2005



Agriculture in China 2009



Mainstream Environmentalism: Incapable of coping...

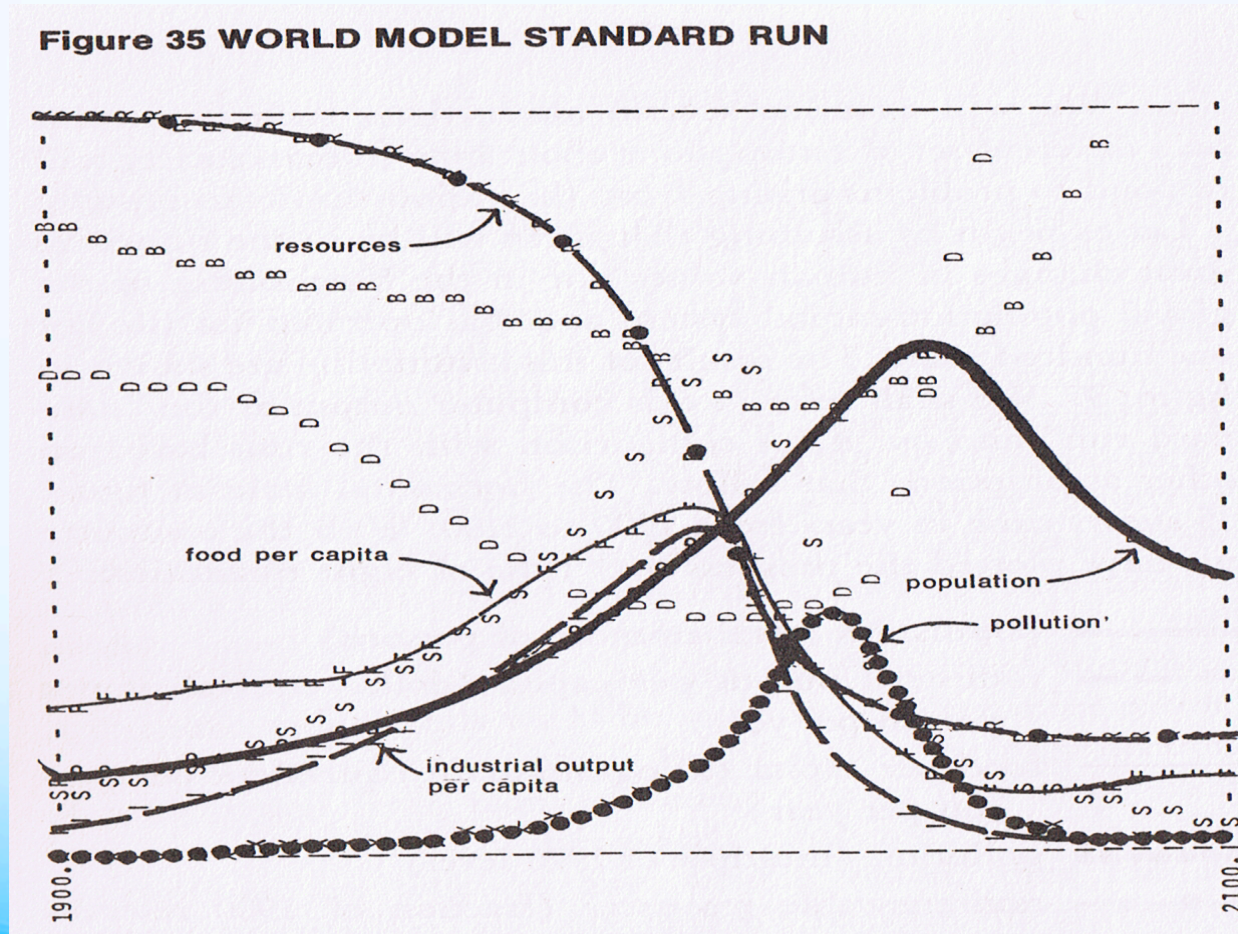
- It is no accident that environmental crisis is gathering as social injustice is deepening and growing inequality is impairing democratic institutions. Each is the result of a system of political economy--today's capitalism--that is profoundly committed to profits and growth and profoundly indifferent to nature and society.... While environmentalists have been winning many battles, we are losing the planet.... The escalating processes of climate disruption, biotic impoverishment and toxification--which continue despite decades of warnings and earnest effort--are a severe indictment of capitalism.... **An ever growing world economy ... is undermining the ability of the planet to sustain [human] life.**

James Gustave Speth, "Global Warming and Modern Capitalism", in *The Nation*, October 6, 2008

IAASTD 2008

- They conclude **we have little time to lose** if we are to change course. Continuing with current trends would exhaust our resources and put our children's future in jeopardy.
- Professor Bob Watson, Director of IAASTD said: "To argue, as we do, that **continuing to focus on production alone will undermine our agricultural capital and leave us with an increasingly degraded and divided planet** is to reiterate an old message. But it is a message that has not always had resonance in some parts of the world. If those with power are now willing to hear it, then we may hope for more equitable policies that do take the interests of the poor into account."

The 1972 projection of the Club of Rome



Ban Ki-moon's High-Level Task Force (HLTF) on the Global Food Security Crisis

- **The extraordinary rise of global food prices in early 2008 posed a major threat to global food and nutrition security and caused a host of humanitarian, human rights, socio-economic, environmental, developmental, political and security-related consequences.** In particular, it presented challenges for low income food deficit countries and severely affected the world's most vulnerable. It threatened to reverse critical gains made toward reducing poverty and hunger as outlined in the Millennium Development Goals (MDGs)....

<http://www.un.org/issues/food/taskforce/background.shtml>

HLTF (FAO mise à jour)

- ...The **soaring prices** stemmed from the cumulative effects of long-term trends, like the increasing **demand** of food due to the growing world population and a decline in agricultural **investment**, more immediate supply and demand dynamics, including those related to the rapidly increasing oil prices and diversions of maize to ethanol production, and responses like hoarding which exacerbated price volatility. Altogether, **the crisis exposed underlying structural problems in the food systems of poorer countries, partly linked to serious distortions in world food markets (associated with production subsidies in rich countries and trade tariffs), that predispose to price spikes and problems with food availability.** Climate-related events like droughts, floods and environmental degradation have further negative effects on many developing countries.

The FAO: June 2008

- **In June 2008** the Food and Agricultural Organisation (FAO) convened the High-Level Conference on Food Security and the challenges of climate change and bio-energy in Rome. It concluded with **a Declaration that includes calls for increased food production, fewer trade restrictions and increased agricultural research.**

<http://www.un.org/issues/food/taskforce/background.shtml>

UN Secretary General in 2009

- **In January 2009**, Spanish Prime Minister Rodriguez Zapatero and **the Secretary-General Ban Ki-moon convened the High Level Meeting on Food Security for All** in Madrid. At the meeting, there was widespread support for the CFA's twin-track approach that **addresses food security in a comprehensive way.**

<http://www.un.org/issues/food/taskforce/background.shtml>

Civil Society to the FAO: 2009

- **22 September 2009.** We, the undersigned civil society organizations from around the world ... are very concerned that **next to none of the preparatory or background documents [of the FAO] for the Expert Forum contain reference to the IAASTD, which was a four-year, multi-disciplinary and twice-peer-reviewed assessment that was formally accepted by 58 countries in 2008. Nor are any of the experts who contributed to this assessment mentioned as panelists on the Expert Forum website.**
- If **the FAO** is to effectively and credibly address the question of “how to feed the world” it **cannot ignore the findings of the most recent and comprehensive global agricultural assessment.**
- http://www.agassessment-watch.org/docs/IAASTD_letter_to_FAO_and_reply.pdf

Ban Ki-moon widens the view

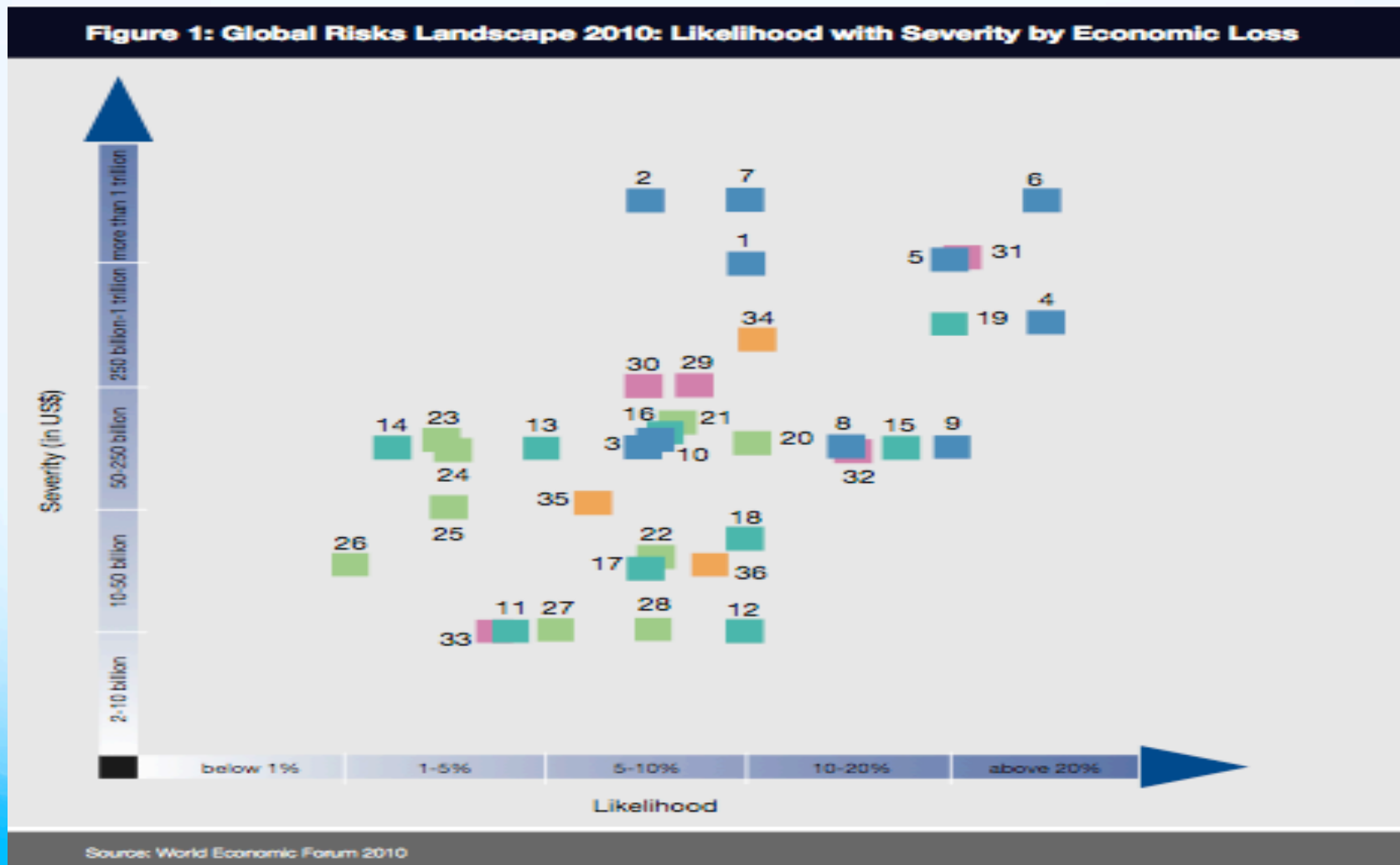
- The Secretary-General's Remarks at Food Security and Climate Change Conference, Rome, Italy (**16 November 2009**)
 - **We came to Rome to discuss food security. But I think we are all aware that there can be no food security without climate security. The global population is growing and so are demands on food production. Changes in the global climate are likely to make it harder – not easier – to produce the food we need.**

Davos: Global Risks 2010

- **Three themes provide the backdrop** for discussion in this report. As the first chapter discusses, the increase in interconnections among risks means **a higher level of systemic risk than ever before.**
- Second, while sudden shocks can have a huge impact, be they serious geopolitical incidents, terrorist attacks or natural catastrophes, the biggest risks facing the world today may be from **slow failures or creeping risks.** Because these failures and risks emerge over a long period of time, their potentially enormous impact and long-term implications can be vastly underestimated.
- Finally, the third theme picks up the discussion of **global governance gaps from last year's report.** In light of ongoing short-term pressures on governments, business and individuals, can the necessary reform of global governance be achieved across the range of issues where it is required?

Op.cit., Executive Summary, p.5

Davos risks (cf. 1, 20, 21, 22)



The risks

Economic Risks

- 1 Food price volatility
- 2 Oil price spikes
- 3 Major Fall in the US \$

Environmental Risks

- 20 Extreme weather
- 21 Droughts and desertification
- 22 Water scarcity

State of the situation

- **FAO: 29 September 2009**

We will need to **increase food production by 70%** to feed the projected, much larger population (even if it is not growing as fast as before...), taking into account the need to better feed those who are already here and lacking.

- **2010:** This doesn't include the major efforts by the OECD to use the land for **bioproducts and biofuels**. That is another issue, although many of you may well be involved in various aspects of these initiatives.

The OECD follows up on the FAO

- Recognizing that advances in **biotechnology and genetics offer much promise for sustainable growth and development...**
 - first premise of OECD draft recommendation
- The development of **a bioeconomy [is] necessary if OECD countries are to achieve long-term economic growth** (that also addresses environmental and social needs)... - first sentence of OECD workshop plan
- **This**
 - **in spite of 60 years of failed development** for most of humanity
 - in spite of the fact that **growth has not produced its promised results**

A response to peak oil by the United States [and Europe]

- The United States industry has had a particular interest in developing biobased products [because] **the United States may never again be price-competitive on petroleum and natural gas feedstocks for developing petrochemical products** against oil and gas supplies in certain other areas of the world . Both oil and natural gas production costs seem likely to remain lower in several areas of the world such as Russia, West Africa, and the Middle East than in the United States. A number of these countries currently are pursuing a development policy focused on exploiting their economic advantage in petroleum and natural gas production by moving downstream in the industry to develop petrochemical industries to serve world markets. On the other hand, **U.S. industry seems convinced that the United States can meet world-class feedstock competition in the production of bio-based feedstocks for its chemical industries.** This is their fundamental point of departure, replacing oil with bio.... USDA paper (Duncan, Conway et al)

**“Highest potential of biomass production ...
in exactly those zones with very high or high
biodiversity”**

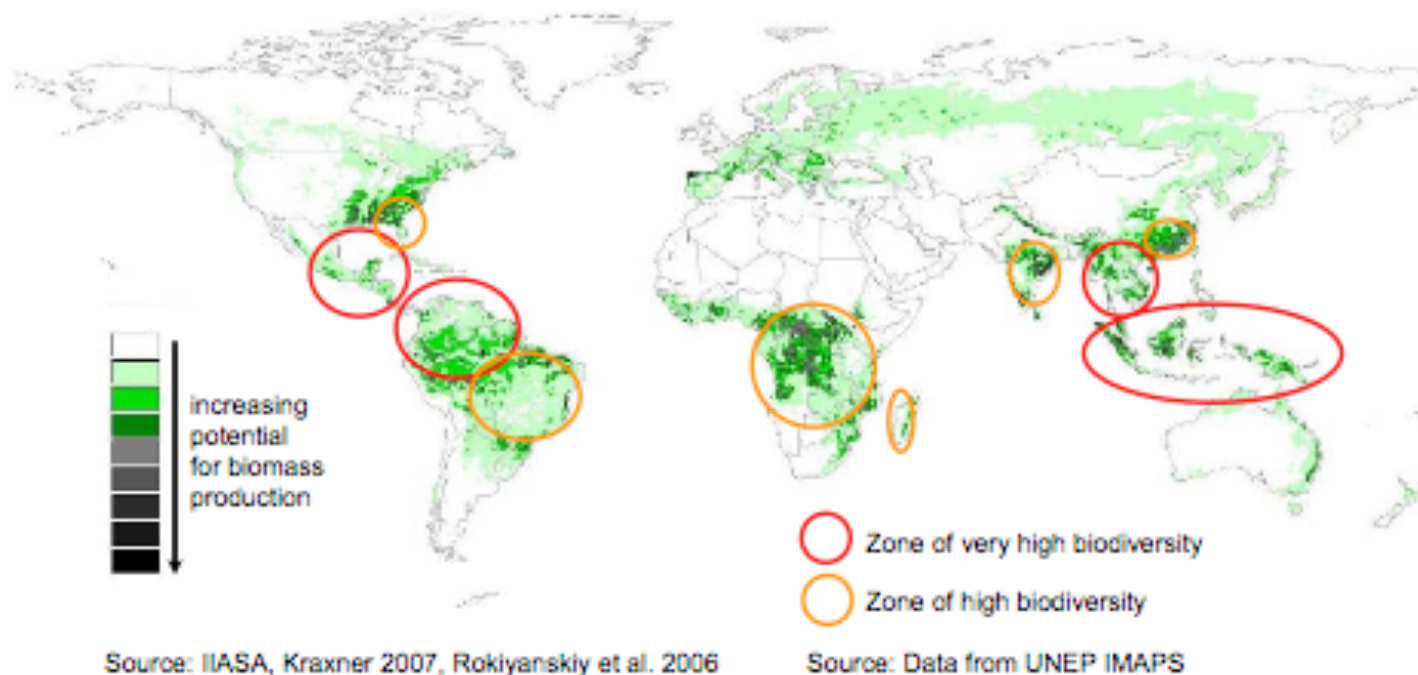
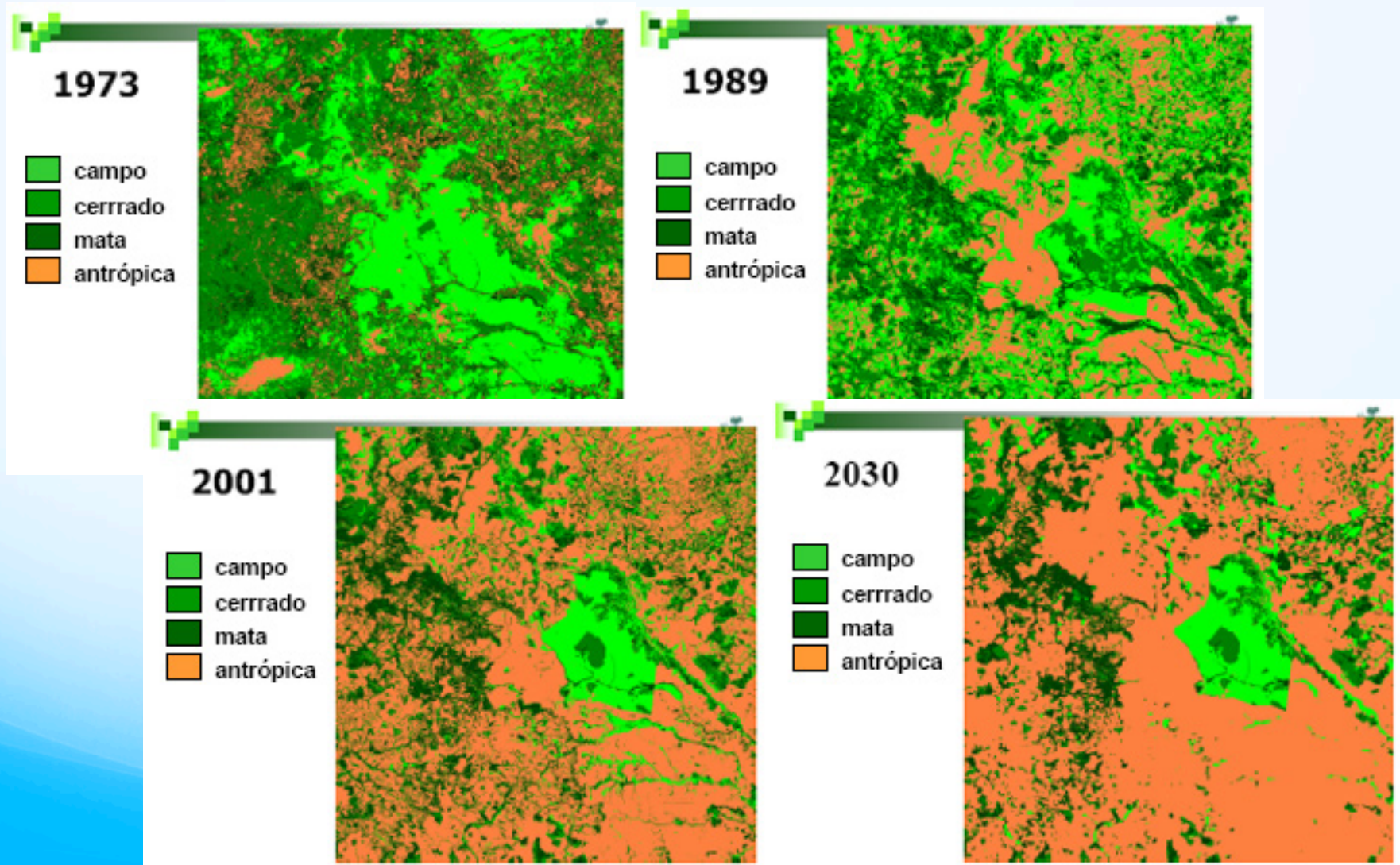


Figure 9 Conflict zones: high potentials for biomass production vs. high biodiversity

Source: German report, p.57

Protection of natural biosphere areas (forests, grasslands, ...)

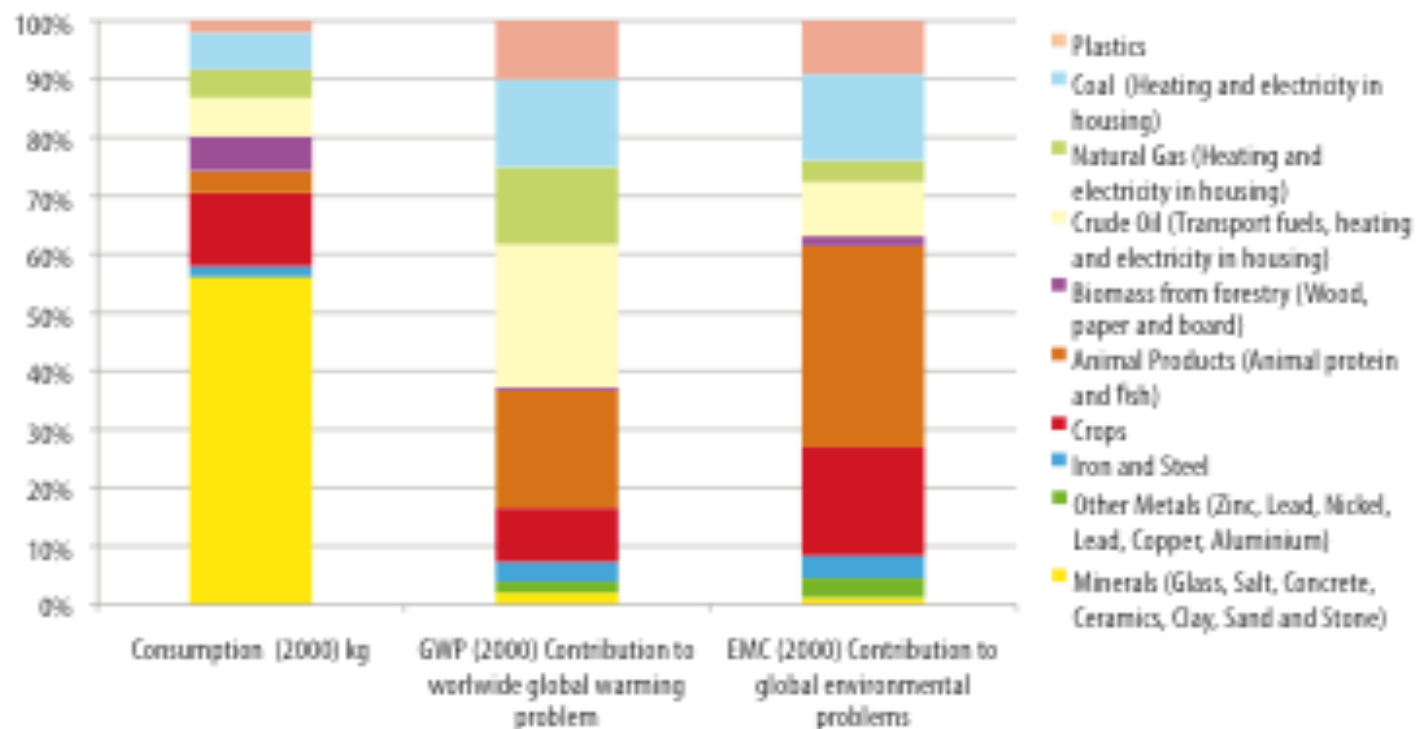


The context for agriculture (and for everything else)

- Homer-Dixon's tectonic stresses (2006)
 - **population stress** (growth rates and megacities)
 - **energy stress** (declining EROI et scarcity)
 - **environmental stresses** (fisheries, forests, land, water)
 - **climate stress**
 - **economic stress** (instability of financial system, inequity)
- And their multipliers
 - **Rising speed and global connectivity**
 - Escalating **power of small groups** to destroy

Back to the 2010 UNEP report

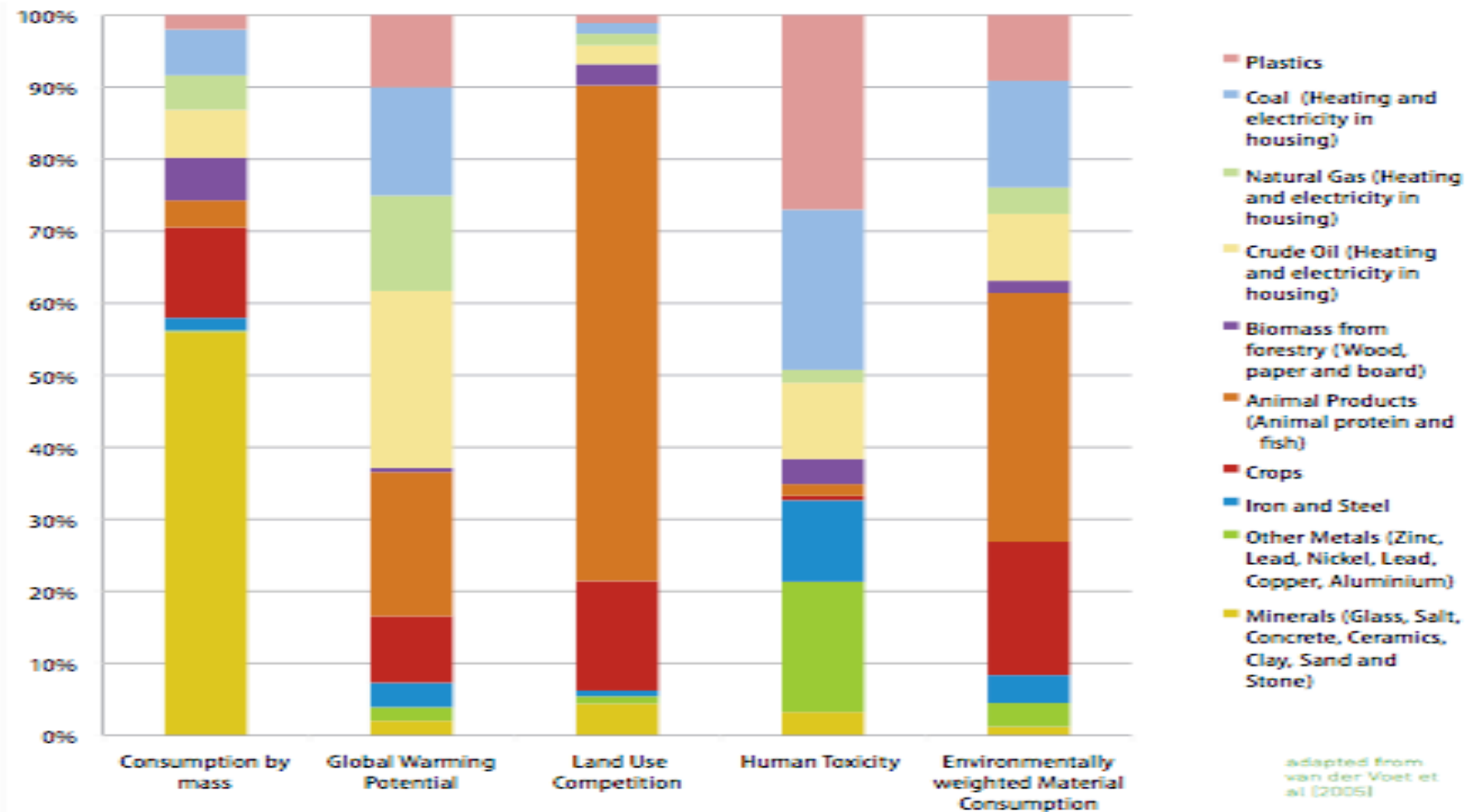
Figure 16: Normalized global warming potential of material flows and Environmentally weighted Material Consumption (EMC) for the EU-27+1 region



Source: van der Voet et al. (2005)

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Figure 5.6: Relative contribution of groups of finished materials to total environmental problems (total of the 10 material groups set at 100%), EU-27+Turkey, 2000



The Fat Planet 2009: Our Footprint = 1.3 Planets

